DOCUMENT RESUME

ED 109 387	CE 004 220
AUTHOR	Meyer, Robert P.; And Others
TITLE	Behavioral Taxonomy of Undergraduate Pilot Training Tasks and Skills: Guidelines and Examples for Taxonomy Application in Flying Training Research. Final Report.
INSTITUTION	Air Force Human Resources Lab., Williams AFB, Ariz. Flying Training Div.; Design Plus, St. Louis, Mo.
REPORT NO	AFHRL-TR-74-33(IV)
PUB DATE	Dec 74
NOTE	192p.
EDRS PRICE	MF-$0.76 HC-$9.51 PLUS POSTAGE
DESCRIPTORS	*Aircraft Pilots; Data Collection; *Flight Training; Guidelines; Skill Analysis; Skill Development; *Task Analysis; *Task Performance; *Taxonomy; Undergraduate Study
IDENTIFIERS	*Air Force

ABSTRACT

The report presents the results of the third phase of a research program to develop a behavioral taxonomy of undergraduate pilot training (UPT) tasks and skills. The third phase effort consisted of surface analyses of 50 UPT flying training tasks to generate basic task descriptions. The surface analysis subdivided and defined task elements into a series of cue, mental action, and motor action sequences. A set of classification rules was developed to categorize the skills needed to perform the tasks identified by the surface analysis information. The classification rules were used to classify all the surface analyses. The skills required to accomplish the tasks were determined and organized into a matrix system of skill data. The matrix system selected provided the means for simple data retrieval operations. The result was to develop the surface analysis method in order to analyze future UPT objectives in terms of present and future flying training requirements and to develop four applications of the taxonomic data system to flying training research problems. The illustrative examples dealt with skill comparisons among different tasks, the determination of skill difficulty within and between tasks, developing standard training tasks and generating new training tasks to teach specific flying skills. (Author/JB)

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AFHRL-TR-74-33(IV)

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BEHAVIORAL TAXONOMY OF UNDERGRADUATE PILOT TRAINING TASKS AND SKILLS:

GUIDELINES AND EXAMPLES FOR TAXONOMY APPLICATION IN FLYING TRAINING RESEARCH

By

Robert P. Meyer
Jack I. Laveson
Neal S. Weissman
Design Plus
9955 Warshire Drive
St. Louis, Missouri 63132

Edward E. Eddowes

FLYING TRAINING DIVISION
Williams Air Force Base, Arizona 85224

December 1974
Final Report for Period July 1973 – September 1974

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BROOKS AIR FORCE BASE, TEXAS 78235

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This final report was submitted by Design Plus, 9955 Warshire Drive, St. Louis, Missouri 63132, under contract F41609-73-C-0040, project 1123, with Flying Training Division, Air Force Human Resources Laboratory (AFSC), Williams Air Force Base, Arizona 85224. Dr. Edward E. Eddowes was the contract monitor.

This report has been reviewed and cleared for open publication and/or public release by the appropriate Office of Information (OI) in accordance with AFR 190-17 and DoDD 5230.9. There is no objection to unlimited distribution of this report to the public at large, or by DDC to the National Technical Information Service (NTIS).

This technical report has been reviewed and is approved.

WILLIAM V. HAGIN, Technical Director
Flying Training Division

Approved for publication.

HAROLD E. FISCHER, Colonel, USAF
Commander

Unclassified
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER
AFHRL-TR-74-33(IV)

2. GOVT ACCESSION NO.

3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle)
BEHAVIORAL TAXONOMY OF UNDERGRADUATE PILOT TRAINING TASKS AND SKILLS: GUIDELINES AND EXAMPLES FOR TAXONOMY APPLICATION IN FLYING TRAINING RESEARCH

5. TYPE OF REPORT & PERIOD COVERED
Final
July 1973 – September 1974

6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s)
Robert P. Meyer
Jack I. Laveson
Neal S. Weissman
Edward E. Eddowes

8. CONTRACT OR GRANT NUMBER(s)
F41609-73-C-0040

9. PERFORMING ORGANIZATION NAME AND ADDRESS
Design Plus
9955 Warshire Drive
St. Louis, MO 63132

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
62703F
11230217

11. CONTROLLING OFFICE NAME AND ADDRESS
Hq Air Force Human Resources Laboratory (AFSC)
Brooks AFB, TX 78235

12. REPORT DATE
December 1974

13. NUMBER OF PAGES
190

14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)
Flying Training Division
Air Force Human Resources Laboratory
Williams Air Force Base, AZ 85224

15. SECURITY CLASS. (of this report)
Unclassified

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

This report consists of 4 volumes.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

task and skill taxonomy
task taxonomy development
skill taxonomy development
flying task taxonomy
flying skill taxonomy
flying tasks and skills
relationship between tasks and skills
taxonomy data system
taxonomy research applications

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report presents the results of the third phase of a research program to develop a behavioral taxonomy of undergraduate pilot training (UPT) tasks and skills. The Phase III effort consisted of the continued development of surface analyses to include instrument flight maneuvers, the classification of the resulting surface analysis information and its integration within the taxonomic data system, an analysis of future UPT objectives in terms of present and future flying training requirements and the development of four applications of the taxonomic data system to flying training research problems. The illustrative examples dealt with skill comparisons among different tasks, the determination of skill difficulty within and between tasks, developing standard training tasks and generating new training tasks to teach specific flying skills.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

Unclassified
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

SUMMARY

PROBLEM:

The objective of this research effort is to analyze and specify the fundamental flying abilities which comprise the training objectives of undergraduate pilot training (UPT). The results of this analysis will be used to structure research on and make recommendations for improvements in Air Force flying training programs.

APPROACH:

Surface analyses of fifty UPT flying training tasks were accomplished to generate basic task descriptions. The resulting task information was used to identify the pilot skills required to execute the flying tasks described. The surface analysis subdivided and defined task elements into a series of cue, mental action, and motor action sequences. A set of classification rules was developed to categorize the skills needed to perform the tasks identified by the surface analysis information. The classification rules defined a taxonomic cubic concept in which cues were represented on the vertical (x) axis of the cube, mental actions on the depth (y) axis and motor actions on the horizontal (z) axis. The classification rules were validated empirically.

RESULTS:

The classification rules were used to classify all the surface analyses. Thus, the skills required to accomplish the tasks were determined and organized into a matrix system of skill data. The matrix system selected provided the means for simple data retrieval operations. This Phase III report focused on application of the taxonomic data system to flying training research problems. Four examples were provided to illustrate how the taxonomy could be used to compare the skills needed to perform two or more flying tasks; to determine the relative difficulty of skills required in different training tasks; to develop standard flying tasks and to generate new training tasks which have specific skill training properties.

CONCLUSION:

The taxonomy of UPT tasks and skills developed during this research is an analytical tool of considerable generality that can be used to aid in understanding the essential requirements of flying training and to support the development of more effective flying training programs.

PREFACE

This report summarizes a portion of the research being accomplished in support of Project 1123, Flying Training Development under the direction of Dr. William V. Hagin. The study was documented under Task 112302, Instructional Innovations in USAF Flying Training, Mr. Gary B. Reid, Task Scientist, and work unit 11230217, A Behavioral Taxonomy of Undergraduate Pilot Training, Dr. Edward E. Eddowes, Contract Monitor. Capt. Jack A. Thorpe assisted in editing this summary of the task and skill taxonomy development effort.

The research reported herein was conducted under the provisions of contract F41609-73-C-0040 by Design Plus, St. Louis, Missouri, Mr. Robert P. Meyer, Principal Investigator. This effort covered the period between July 1973 and September 1974.

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INTRODUCTION

This report presents the results of the third and final phase of a research program to develop a behavioral taxonomy of undergraduate pilot training (UPT) tasks and skills. In this report, examples are presented to show how results derived from the surface analyses, taxonomy structure and classification system, developed in earlier phases of this effort, could be used to identify and solve problems related to present and future flying training research.

In Phase I, a surface task analysis format was developed based on a study of a number of previous task analysis efforts. The new format was generated by repeated test and revision specifically for use in the present taxonomy development effort. It provided descriptions for three kinds of transitional flying tasks. Fundamental transitions were identified as a change from one steady-state to another, such as going into a climb or descent from straight and level flight. Composite transitions were developed from combinations of two or more fundamental transitional tasks in a procedural sequence; for example, during takeoffs, cross-country flights and landings. Continuous transitions may combine any number of fundamental and composite transitional tasks in rapid succession to complete maneuvers such as loops and rolls. The surface analysis format divided each task into sequences and each sequence into Cue (C), Mental Action (ME), and Motor Action (MO) elements. In Phase I, surface analyses of fourteen fundamental and two composite transitional tasks were completed. Next, the skills required to perform the tasks described in the surface analyses were identified, thus, providing data on which the initial development of the taxonomic structure was based.

Taxonomic rules were developed for the systematic classification of Cue, Mental Action, and Motor Action elements of each surface task analysis sequence. The approach was to extract those behavioral elements which were required for the performance of the flying tasks analyzed. Each flying skill identified by the surface task analysis was systematically subdivided until behavioral elements emerged as the smallest part of the structure.

The resulting rules formed a taxonomic cubic concept. The Cue face of the cube was divided into the total outcomes of the Cue rules. Likewise, the Mental Action and Motor Action faces were divided by their respective classification rules. The result was a concise notation for the classification of all skills.

A validation research plan was then developed to determine how well the taxonomy could be used. The Phase I effort, thus, was the groundwork upon which a simple, yet meaningful taxonomic structure and classification system was built.

The initial Phase II work focused on the development of a surface analysis for twenty-two additional flight maneuvers. With these surface task analyses in hand, it was then necessary to establish the relationship between the surface analysis and the taxonomic classification rules, and to validate the use of the rules by categorizing flying tasks and skills within the taxonomic structure. Following the taxonomy refinement and testing, a hierarchy of taxonomic rules was devised to define how flying skills could be sorted. The resulting hierarchy of rules was adapted to a matrix system of skill information categorization. The matrix system was found to provide the means for a simple information retrieval system.

The Phase III effort extended the development of surface task analyses to include instrument flight maneuvers. These tasks were classified, categorized and added to the taxonomic information system. The surface task analyses of fourteen fundamental instrument transition and two composite instrument transition flight maneuvers are presented in Appendix A. The results of the classification of the surface task analyses are presented in Appendix B.

Future undergraduate pilot training (FUPT) objectives also were investigated. These data were examined with reference to both present and future flying training needs. The FUPT studies suggested that substantially different flying training would be required during the 1975-1990 time frame. Details of the results of this study of the FUPT training objectives may be found in Appendix C.

Illustrating and evaluating the ultimate usefulness of the now fully developed taxonomy as a working tool was approached from the standpoint of training research applications to the FUPT training objectives. Four examples of research applications were developed presenting sample operations of data acquisition and analysis procedures.

GUIDELINES AND EXAMPLES FOR TAXONOMY APPLICATIONS IN FLYING TRAINING RESEARCH

The approach to taxonomy applications in this research effort was to determine where the introduction of such information would be beneficial in solving problems related to flying training. The applications focused on the different ways the taxonomy and taxonomic data system could be used. These areas are important since a researcher using them will need to be aware of how the system functions and how various kinds of information can be entered into and retrieved from the system.

The taxonomy has been directed toward present and future training needs. Four examples have been derived from operations within the taxonomy system to show how the taxonomy can be used to:

1. Compare skills between two or more flying tasks to determine commonality on a one-to-one basis.

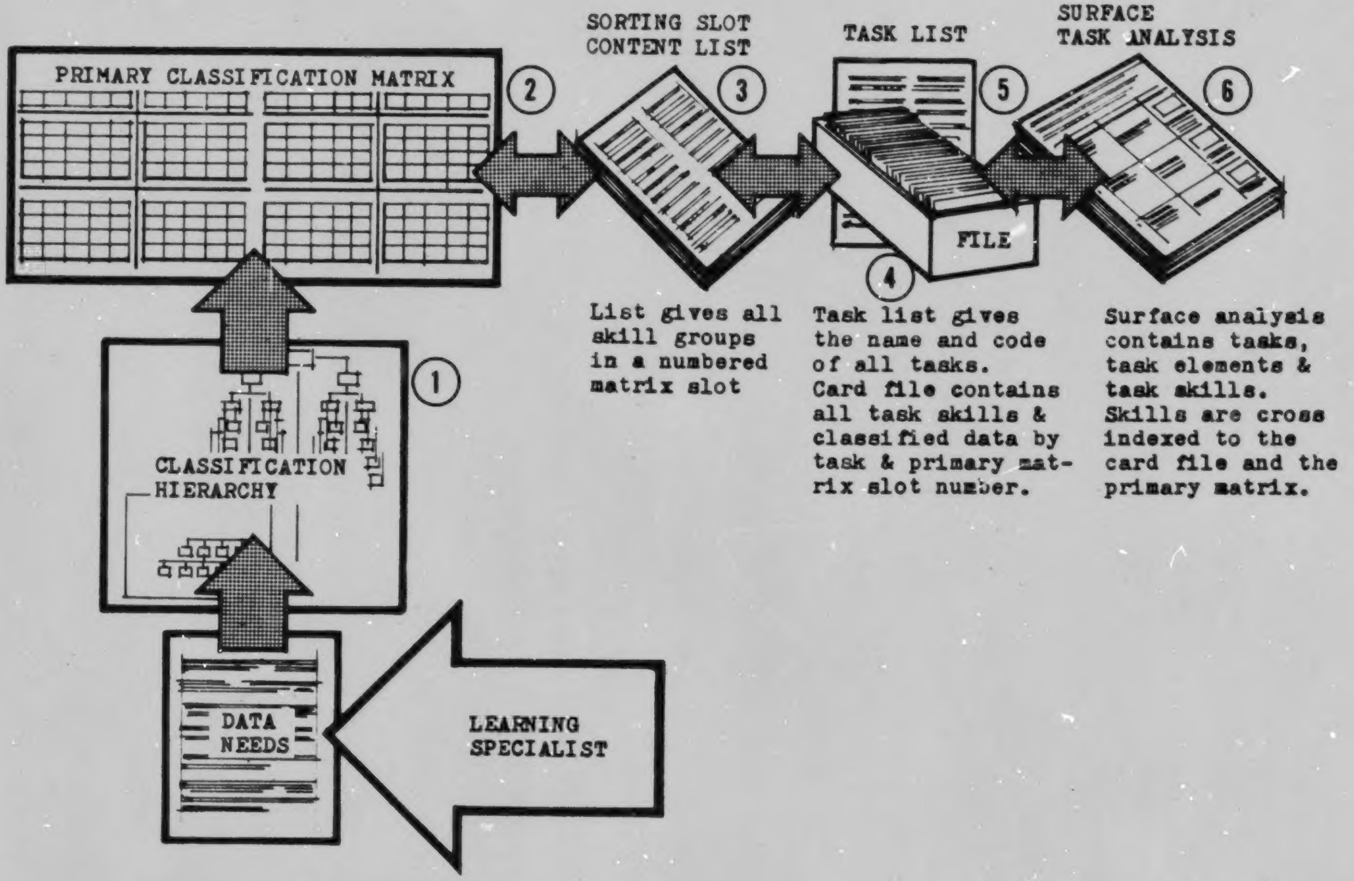
2. Generate information to support a comparison of the relative difficulty of skills of one task to the skills of another task in terms of Cues, Mental Action and Motor Action requirements.

3. Supply analysis to assist in the development of standard flying tasks with evaluation procedures to judge the effectiveness of the proposed tasks.

4. Supply analysis to assist in the development of a specific training task to be used to train for proficiency of a specific maneuver.

The scope of this research has not permitted an exhaustive exploration of how the taxonomy could be used; however, practical applications have been provided not only for the examination of present UPT syllabus tasks, but also for the development of future tasks and instructional materials. Other uses will undoubtedly be found as other researchers work with the system and develop methods of their own to utilize the various types of information contained in the taxonomy.

The Taxonomic Data System - A system has been devised which organizes flying task and skill information within the taxonomy so that it can be utilized without specialized training in taxonomy development. The system shown in Figure 1 contains the following six basic cross referenced data areas:


PRIMARY CLASSIFICATION MATRIX
②
SORTING SLOT CONTENT LIST
③
TASK LIST
FILE
④
⑤
SURFACE TASK ANALYSIS
⑥
①
CLASSIFICATION HIERARCHY
DATA NEEDS
LEARNING SPECIALIST

List gives all skill groups in a numbered matrix slot

Task list gives the name and code of all tasks.
Card file contains all task skills & classified data by task & primary matrix slot number.

Surface analysis contains tasks, task elements & task skills.
Skills are cross indexed to the card file and the primary matrix.

Figure 1. Taxonomy Data System

1. Classification Hierarchy - This was the basic organizational structure used in categorizing all tasks and skills within the taxonomy. It was directly related to the nine rules used to classify all tasks in the surface analysis. The hierarchy shows at what specific levels data generated by each of the nine rules can be found. A classification hierarchy diagram and the nine rules to which it is related may be found in Appendix D.

2. Classification Matrix - The classification matrix was the primary device used in sorting all flying skills into basic skill groups. Consequently, it also became the focal point of the taxonomy as a useful tool. Appendix D shows the matrix development procedure. Note that the classification hierarchy provided the basic organization of the information as it entered the matrix. The matrix, composed of eight sub-blocks, allowed the final sorting of skills into basic skill groups with the order shown in the classification hierarchy. The original research matrix was a four by eight foot board and allowed a hands on method of developing a useful system. This large board was refined into a matrix shown in Appendix D. Each matrix sub-block showing the Cues/Complexity, one through four on the vertical axis, and the Motor Action/Complexity, ranking one through five on the horizontal axis, was consistent with the classification hierarchy. Each slot in the matrix was number coded and showed the number of skills it contained. A darkened slot contained no skills.

3. Sorting Slot Content List - This list found in Appendix D shows the tasks and skills in coded form and established the basic skill groups contained in each slot in a matrix sub-block.

4. Task List - This list translated the task code into the task name and related directly to the surface analysis tasks. The list is found in Appendix D.

5. Card File - A skill card file was established to cross reference all skill information in the taxonomy data system. The sample card in Appendix D shows the content of the card and the translation of the coded data it contains. These skill cards are filed according to the order shown on the task list.

6. Surface Task Analysis - The surface analysis provided the task information upon which the taxonomy was built. Each task was made up of task sequences with the Cues, Mental Action, and Motor Action (C-ME-MO) elements forming the substance of each sequence. Since the C-ME-MO elements are the building blocks for identifying the basic

skills of each task, reference to this information can be most important to researchers. For this reason, the skill information found on each file card is also found as a cross reference in each C-ME-MO sequence in the surface analysis. An example of the relationship of this data can be found in Appendix D.

The four examples which follow will illustrate the usefulness of the taxonomy as a research tool. They show how the six areas of the data system function to assist in the solving of specific research problems concerning current or future flying training requirements.

Example 1 - Redundancy Analysis

The taxonomy is uniquely suited to compare training tasks on a skill-by-skill basis to determine commonality. As an illustration, three maneuvers: the loop, Immelmann and Cuban 8 were compared. Figure 2 shows these maneuvers and their task sequences. First the task information was restructured into a suitable format. Next, the tasks were compared to determine commonality and divergence, and finally these comparisons were interpreted.

After a review of the maneuvers and their task analyses, a basic skill-by-skill enumeration was developed. As shown in Table 1, the enumeration used the sorting slot codes assigned to each skill group in the taxonomy. The skills followed the same order as the elemental sequences in the task analyses. These sequences were then compared to determine similarity. A sequence was judged similar when the majority of the skills were identical. Based on this criterion, elemental sequences A through G were almost identical. Also, a large number of skills in the other sequence portion were the same as shown by the underlined numbers.

The identical sequence indicated that the first part of each task could be taught at one time and thus form a training task. This training task would be an intermediate stage in the learning of these tasks.

Another use of the analysis was to determine the training sequence of these tasks as the current UPT syllabus gives no such guidance. Based on their lengths as shown in the figure, either the loop or Immelmann should be taught first, followed by the Cuban 8. However, this criterion failed to take into account task complexity, expressed by the percentage of simple versus complex judgments. For example, the loop contained 50% simple judgments while the

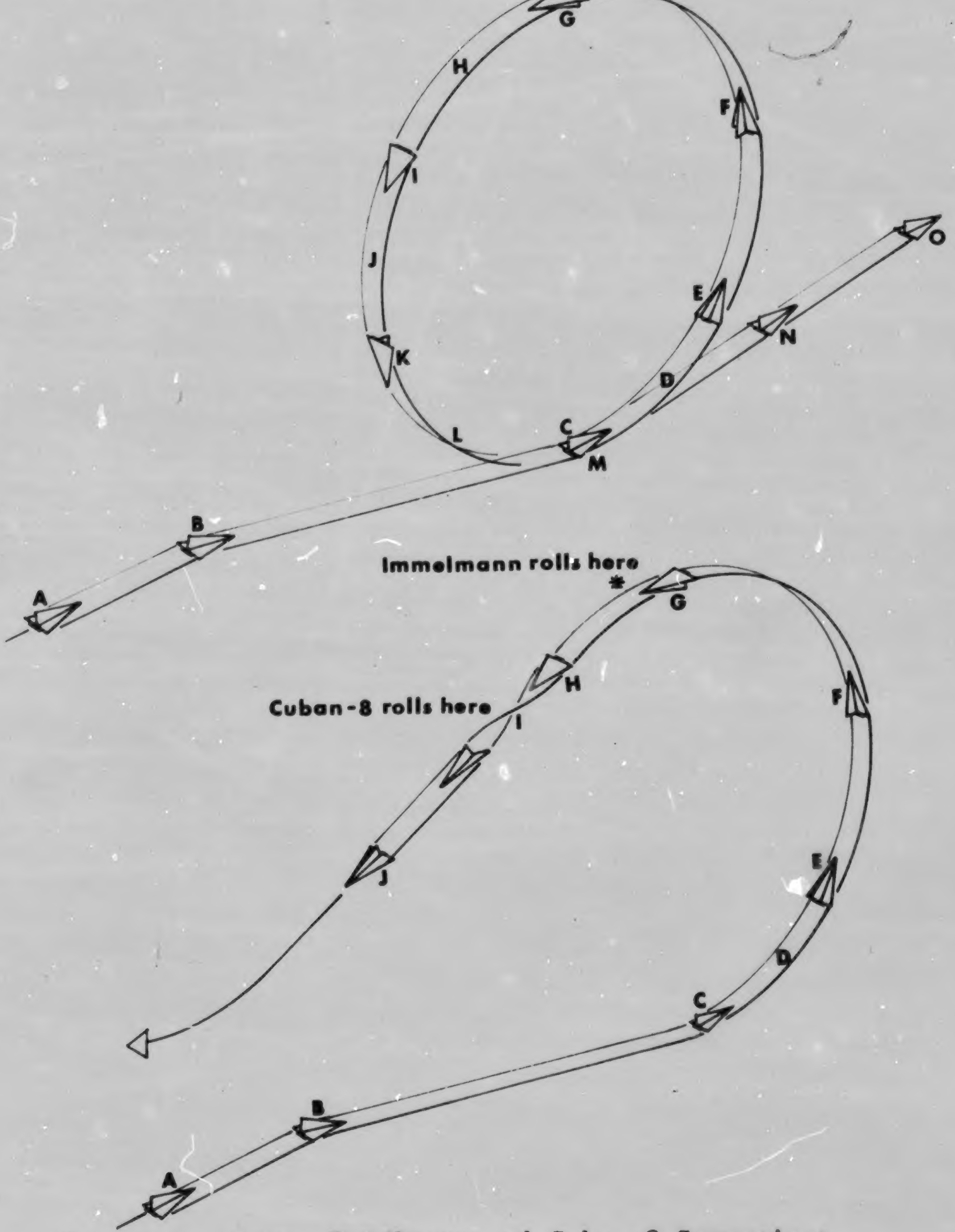

G
H
F
I
J
E
O
N
K
D
L
C
M
B
A
Immelmann rolls here
*
G
H
Cuban-8 rolls here
I
F
J
E
D
C
B
A

Figure 2. Loop, Immelmann and Cuban-8 Comparison

Table 1. Task Comparison by Elemental Sequences

Element Sequence	Loop	Immelmann	Cuban 8	Comments
A	161*	161*	161*	Identical Sequence
B	102	102	102	
C	66*	66*	66*	
D	126	126	126	
E	142	142	142	
F	121	121	121	
G	141	141	141	
H	41*	141	125	Similar Sequence
I	141	125	123	
J	144	142	165*	
K	45*	125	41*	
L	41*	122	142	
M	5*	27*	121	
N	32		141	
O			125	
P			123	
Q			165*	
R			41*	
S			142	
T			22*	

* Indicates Simple Judgment Skills
___ Indicates like Skills

Immelmann only 13%. As these tasks are of approximately equal length, then the loop should be taught first. Lastly, the Cuban 8 should be taught, for although it contained 35% simple judgments it was about one-and-one-half times as long as the others.

This type of analysis was only a first step to the restructuring of maneuvers and syllabus sections. Further examples of increasing utility which incorporate more aspects of the taxonomy follow.

Example 2 - Difficulty Index

The taxonomic system was used to determine and compare the relative difficulty of flying tasks and skills in terms of Cues, Mental Actions and Motor Actions. This type of evaluation could be used to express the orderliness of syllabus progression or the suitability of a specific task placement within the syllabus.

The initial approach in investigating this aspect of the taxonomy was to sort all of the classified skills into simple and complex judgment groups. This was a logical starting point for this analysis as the judgment dichotomy was the first division in the classification hierarchy. In addition, judgment was the factor singled out by the UPT instructor pilots in interviews conducted during an earlier phase as the most difficult to teach aspect of flying training.

Each task was sorted into one of three categories: easy, average, or difficult. Task difficulty was determined by the number of skills requiring complex judgments compared to the number requiring simple judgments within each task. If more than half of the skills in a given task required simple judgments, the task was classified easy. However, if there were an equal number of skills requiring simple and complex judgments, the task difficulty was judged average. If more complex than simple judgments were required, it was considered a difficult task. The thirty-four contact flying tasks were used for this analysis. Table 2 shows the result of the sorting process.

Table 2. Task Difficulty by Simple vs. Complex Judgment

Task Characteristic	Easy	Average	Difficult	Total
Fundamental	6	8	0	14
Composite	8	1	4	13
Continuous	1	0	6	7
Totals	15	9	10	34

An attempt was made to analyze the current syllabus for the T-37 and T-38, and determine whether the sequence of tasks presented to the student pilot provided a progression of difficulty. This effort, however, was largely unsuccessful since the syllabus of instruction does not contain sufficient information on the actual sequences in which maneuvers are presented to the student. This was true for both the T-37 and T-38 sections, where maneuver introduction was indicated as occurring during an instructional unit which covered several sorties and a variety of maneuvers.

The first difficulty index analysis indicated that a more comprehensive method of task difficulty assessment was needed if meaningful comparisons of skill difficulties were to be made. Thus, a numerical system was devised which assigned a number to each behavioral element in a skill. These numbers were then summed to provide a difficulty index for that skill. In this manner each skill within each task could be given a relative difficulty value. Moreover, a task difficulty index could be achieved by finding the mean of the skill difficulty indices for the skills in the task.

Sample - The difficulty index for Task F-1, skill (A) was evaluated as follows:

Behavioral Element	Numerical Value
Cues	1
Total Inputs	2
Level	4
Information Processing	3
Judgment	1
Establish Attitude/Rate	1
Control Outputs	3
Rank	5

Total = Difficulty Index of 20

The numerical values were derived from the skill classification cards. For those categories which did not have specific numerical entries, the following system was used:

Information Processing	Numerical Value
Iterative Processing	1
Specific Cue Processing	2
Memory Recall Processing	3
Multi-Cue Processing	4
Judgment	
Simple Judgment	1
Complex Judgment	2
Establish Attitude/Rate	
Establish Attitude	1
Establish Rate	2
Control Outputs	Number of Entries

A difficulty index was determined for each skill in task F-1 and the mean computed. This mean became the difficulty index for each task.

F-1(A) = 20
F-1(B) = 32
F-1(C) = 34
F-1(D) = 22

A mean of 27.00 was derived for task F-1.

No attempt was made to assign weighting factors to the numerical values of the behavioral element categories. Weighting factors which assigned relative importance to the behavioral categories could be determined and applied to the difficulty index calculations. These weighting factors would require careful consideration and should be decided by those people closest to the learning problem, the instructor pilots.[1] The difficulty indices identified in this example are thus non-weighted values and are presented as samples to show how such information could be derived.

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[1] Task difficulty weighting factors could be based on student error frequencies recorded on check flights or on the number of task repetitions required during initial training flights recorded by the student's I.P. or on the best judgment of experienced instructor pilots.

The following tasks in each major task grouping were analyzed and a task difficulty index computed.

Task No.	Description	Task Difficulty Index
F-1	Str. & level/transition to coord. constant alt. turn (60° bank).	27.00
F-2	Str. & level flight/trans. to str. ahead climb	22.25
F-6	60° bank, constant alt. turn/ trans. to cruise descent	22.50
F-8	Str. ahead climb/trans. to coord. climbing turn - 30° bank	24.60
Cp-1	Normal takeoff & climbout	25.85
Cp-2	360° overhead landing	28.31
Cp-7	Accelerated (high speed) stall	29.29
Cp-11	Formation-turn into wingman	24.67
Ct-1	Str. & level/trans. through a loop	24.14
Ct-3	Str. & level/trans. through an aileron roll	24.29
Ct-6	Immelmann turn	23.92

See Appendix E for the listing of difficulty indices by skill.

Example Conclusion - The capability for obtaining relative skill and task difficulty indices would provide the learning specialist with another bit of specific information as to the task characteristics in the training program. Through systematic evaluation of syllabus task difficulties, a more quantitative approach toward syllabus development and improvement could be undertaken.

Example 3 - Development of a Standard Flying Task

The taxonomy was used to acquire sufficient information to assist in the design and development of a standard flying task. During the development of the standard task, a number of basic guidelines were established which should be valid for the development of new flying tasks. The new flying task should:

1. Encompass all or most of the skills specified as required skills from taxonomy data analysis.

2. Have aerodynamic harmony so that skill building transitions can be flown smoothly.

3. Contain approximately six to eight task transitions so that sequence memorization is minimal for the student.

4. Contain connective skill building transitions so the task can be easily repeated within airspace requirements.

5. Contain a balance between skill building transitions and steady-state flying commensurate with student experience.

It was first determined that insight into standard task design criteria could be gained by examining those sorting slots in the Data System Matrix which contained the most skills. Analysis of Slot 142 (Complex Judgment, Establish Rate, Multi-Cue Processing, pitch control) which contained twenty-five skills and Slot 145 (Complex Judgment, Establish Rate, Multi-Cue Processing, roll control) with ten skills showed, however, that these skill groups did not appear to lend themselves to: (1) the development of a flyable task of reasonable length, and (2) a high concentration of skill learning characteristics.

To overcome this problem, skills and skill groups were approached from the standpoint of effector output, that is the control combinations which occurred most often throughout contact flying tasks. Effector output combinations were tallied in the entire system by going through the skill card file. Table 3 shows the ten most used effector output combinations in the thirty-four contact flying tasks. A complete list is presented in Appendix F.

Table 3. Effector Output by Skill Frequency

Effector Output	Skill Freq.	Effector Output	Skill Freq.
1. El	49	6. $\begin{array}{c}\underline{\text{Ai}}\\\underline{\text{Ru}}\\\text{El}\end{array}$	22
2. $\begin{array}{c}\left.\begin{array}{c}\text{Ai}\\\underline{\text{Ru}}\end{array}\right\}\\\text{El}\end{array}$	40	7. $\left.\begin{array}{c}\text{Th}\\\text{El}\end{array}\right\}$	13
3. $\begin{array}{c}\underline{\text{Th}}\\\text{El}\end{array}$	33	8. $\left.\begin{array}{c}\text{Ai}\\\text{Ru}\\\text{El}\end{array}\right\}$	13
4. $\begin{array}{c}\underline{\text{Tr}}\\\text{El}\end{array}$	25	9. $\begin{array}{c}\left.\begin{array}{c}\text{Ai}\\\underline{\text{Ru}}\end{array}\right\}\\\underline{\text{El}}\\\text{Th}\end{array}$	10
5. $\begin{array}{c}\underline{\text{Ai}}\\\underline{\text{Ru}}\\\underline{\text{El}}\\\text{Th}\end{array}$	25	10. $\begin{array}{c}\underline{\text{El}}\\\text{Ru}\end{array}$	8

Legend:
Elevator - El
Rudder - Ru
Aileron - Ai
Throttle - Th
Trim - Tr
Coordinated control - }
Non-Coordinated control - —

The ten output areas, shown in Table 3, accounted for 240 of the 277 skills considered in the contact flying repertoire. Theoretically then, approximately 86% of all contact flying could be learned by mastering the skills encompassed in these effector outputs. These data, though interesting, did not offer positive guidance as to which effector output skill groups could be combined to achieve a flyable standard task. It was determined that the combination of a number of logically associated effector output skills offered the most promise. The elevator output was chosen initially because it had the highest frequency. The other skills were added somewhat intuitively; however, all skills had the elevator as part of the effector output combination. The following were chosen as candidate combinations:

Elevator El	49
Elevator and Throttle $\frac{Th}{El}$	33
Elevator and Trim $\frac{Tr}{El}$	25
Elevator and Throttle $\left.\begin{matrix}Th\\El\end{matrix}\right\}$	13
Total Skills	120

Data Acquisition and Analysis - The skills of these candidate effector output combinations were analyzed. Results of this analysis formed four specific data groups which provided design criteria for the development of two standard tasks. The coordinated throttle, elevator output combination was examined as a sample of how this type of skill information could be organized. Appendix F contains analyses of the effector outputs not described in the text.

1. Task/Skill Distribution of Effector Outputs - Initial data for the $\left.\begin{matrix}Th\\El\end{matrix}\right\}$ output combination were accumulated by looking under each R-3 sub-block of the Data System Matrix which is shown in Appendix D. The R-3 sub-block was chosen because this Motor Action rule is associated with the classification hierarchy which categorized all skills having two coordinated outputs. A list was then made of all R-3 slot numbers containing skills. These numbers were then referenced to the sorting slot content list and all desired skill cards were then retrieved from the card file. Skill cards were assembled into skill groups as described by the sorting slot content list located in Appendix D. This organization retrieved the information from the taxonomic data system and also presented a broad overview of the tasks and skills involved. Table 4 shows the distribution according to skill groups. It can be seen that these skills are most used to begin a flying task, since all but one contain the (A) designator.

2. Task/Skill Summary - This grouping determined the depth of the skill involvement for each task. Specifically, it pointed out where skills existed within tasks and in which transitional task area they most frequently occurred. Table 5 shows that $\left.\begin{matrix}Th\\El\end{matrix}\right\}$ outputs have not appeared in composite transitional tasks.

Table 4. Task/Skill Distribution of $\left.\begin{matrix}\text{Th}\\\text{El}\end{matrix}\right\}$ Effector Outputs

Slot Number	Tasks and Skills	Number of Skills
161.	Ct-1(A), Ct-4(A), Ct-5(A) Ct-6(A), Ct-7(A)	5
58.	F-2(A), F-3(A), F-9(A) F-10(A), F-12(A)	5
53.	F-5(A), F-6(A)	2
163.	Ct-4(M)	1
	Total Skills...........	13

(Skills ranked by number of skills in a skill group)

Table 5. Task/Skill Summary

7-Fundamental Tasks	6-Continuous Tasks
F-2(A), F-3(A), F-5(A) F-6(A), F-9(A), F-10(A) F-12(A)	Ct-1(A), Ct-4(A), Ct-4(A), Ct-5(A) Ct-6(A), Ct-7(A)

3. Behavioral Categories in Skill Groups - These data showed the contents of each skill group with the similarities and dissimilarities according to the classification rules. Table 6 shows the coded skill information of the four $\left.\begin{matrix}\text{Th}\\\text{El}\end{matrix}\right\}$ skill groups. Specific cue processing (SC) and recall processing (RP) are two mental actions which should be considered in the standard task development. All skills show simple judgment (SJ) and establish a rate of attitude change (ER).

The cues portion in the top row of each skill group though not specifically expressed was considered as relevant background in the design of a new task segment within the standard task.

Table 6. Behavioral Categories in Skill Groups Involving Th/El Outputs

Slot 161. V 1-C T-3 L-3 SC SJ ER Th/El R-3	Slot 53. VM 2-C T-3 L-3 RP SJ ER Th/El R-3
Slot 58. V 1-C T-2 L-3 RP SJ ER Th/El R-3	Slot 163. VC 2-C T-5 L-3 SC SJ ER Th/El R-3

4. Relationship of Skills and Skill Groups - All skills within a particular skill group were compared on a one-to-one basis at the surface analysis level. This was accomplished by associating the file skill card and its coded task data to the surface analysis code. Table 7 shows an example of this broad skill examination.

This grouping revealed the adjustment of pitch and power, generally in straight ahead flight, either ascending or descending. The table also shows that two kinds of motor actions occur - elevator pressure and elevator movement.

Table 7. Relationships of Skills and Skill Groups Involving $\left.\begin{matrix}\text{Th}\\\text{El}\end{matrix}\right\}$ Effector Outputs

	Task	Skill	Skill vs Aircraft Attitude
Slot 161.	Loop	Ct-1(A)	All skills involved with decreasing pitch and simultaneous increase in power adjustment.
	Clover Leaf	Ct-4(A)	
	Cuban 8	Ct-5(A)	
	Immelmann	Ct-6(A)	
	Vert. Recovy	Ct-7(A)	
	SKILL GROUP FUNCTION: Simple judgment to approach a desired attitude and airspeed by coordinating elevator movement with an increased power. All skills are straight ahead entry to aerobatic tasks.		
Slot 58.	St & L → C	F-2(A)	All skills involved with increasing or decreasing pitch and simultaneous power adjustment.
	St & L → D	F-3(A)	
	C → T	F-9(A)	
	D → St & L	F-10(A)	
	D → C	F-12(A)	
	SKILL GROUP FUNCTION: Simple judgment to approach a desired attitude and airspeed by coordinating elevator movement with power adjustment. All are entry skills for Fundamental Transitions.		
Slot 53.	T → C	F-5(A)	All skills increase or decrease pitch with simultaneous power adjustment.
	T → D	F-6(A)	
	SKILL GROUP FUNCTION: Simple judgment to approach a desired attitude and airspeed by coordinating elevator pressure with simultaneous power adjustment.		
Slot 164.	Clover Leaf	Ct-4(M)	
	Same general discription as Ct-4(A)		

The assimilation of data from all the effector output combination candidates was difficult due to the large number of tasks and skills involved. To aid in this assimilation and the drawing of conclusions based on these data, a distribution of effector outputs across tasks and skills is summarized in Table 8. Of particular interest was the number of tasks requiring these effector output combinations. The percentage of occurrence in each task is shown at the right of the table. Table 9 shows a further analysis of attitude and pilot judgment requirements for the same effector outputs proposed for the standard tasks. Both Tables 8 and 9 give general trend information as to the concentration of the four effector oriented skills and possible emphasis in the task design.

Task Design and Development - Two standard tasks were developed from the previous analysis. There was a wide diversity of skills involving the four effector output combinations in the fundamental and composite transitional task areas. Since the activity was not embodied in any one current task, a new standard task was required. The data compiled from the taxonomy brought the following specific insight to the creation of a new task and assisted in:

1. Isolating specific skills and skill groups to be stressed within the new task.

2. Isolating skill areas across all tasks where specific skills are used.

3. Showing relationships of skill performance to aircraft position in space as aerodynamic task design criteria.

4. Showing relationships of the kinds and quantities of Cues, and percentages of desired Mental and Motor Actions to be designed into the standard task.

In spite of the data points provided by the taxonomy information, the initial new task design relied on the judgment and creative ability of project researchers. Figure 3 shows the results of the standard task development. The task parameters are shown in terms of altitudes, descent or climb rates, and basic cues. A number of surface analyses were performed as task development progressed. These analyses were classified and skills compared on a one-to-one basis with skills and skill groups of the taxonomy data. Appendix F shows the surface analysis of the final standard task iteration. The data sheet with the analysis gives task function information.

Table 8. Distribution of El, $\frac{Th}{El}$, $\frac{Tr}{El}$, $\left.\begin{matrix}Th\\El\end{matrix}\right\}$ Effector Outputs in Specific Tasks and Skills

Task	**Task Skills**																					**% Task**
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	
F-2	TH/EL}	TH/EL	TH/EL	TR/EL	☒																	80%
F-3	TH/EL}	TH/EL	TH/EL	TR/EL	☒																	80
F-5*	TH/EL}	TH/EL	TH/EL	TR/EL	☒																	80
F-6	TH/EL	TH/EL	TH/EL	TR/EL	☒																	80
F-7	TH/EL}	TH/EL	TH/EL	TR/EL	☒																	80
F-9	TH/EL}	TH/EL	TH/EL	TR/EL	☒																	80
F-10	TH/EL}	TH/EL	TH/EL	TR/EL	☒																	80
F-12	TH/EL}	TH/EL	TH/EL	TR/EL	☒																	80
F-13	TH/EL	EL	TH/EL	TR/EL	☒																	80
F-14	TH/EL	EL	TH/EL	TR/EL	☒																	80
																					Average percent of task	80%
Cp-1	☒	☒	☒	☒	TR/EL	☒	☒	☒	☒	☒	TR/EL	☒	☒	☒								15%
Cp-2	☒	☒	☒	EL	☒	☒	☒	☒	☒	TH/EL	☒	☒	☒	☒	☒	☒	TH/EL	TH/EL	TH/EL	TH/EL	☒	33
Cp-3*	☒	☒	☒	EL	☒	☒	☒	EL	EL	EL	☒											36
Cp-5	EL	EL	EL	EL	TH/EL	☒	EL	EL	☒	EL	☒	TR/EL	☒									69
Cp-6	TH/EL	EL	EL	EL	EL	TH/EL	EL	EL	EL	EL	EL	EL	TH/EL	☒								93
Cp-8	EL	☒	☒	☒	☒	☒	☒	☒	☒	☒												10
																					Average percent of task	43%
Ct-1	TH/EL}	TR/EL	EL	EL	☒	EL	EL	EL	EL	☒	☒	EL	☒	TR/EL	☒							66%
Ct-3	☒	EL	☒	☒	☒	☒	☒	☒														12
Ct-4	TH/EL}	TR/EL	EL	TH/EL	☒	☒	☒	☒	☒	TH/EL	EL	EL	TH/EL}	☒								57
Ct-5	TH/EL}	TR/EL	EL	EL	☒	EL	EL	☒	☒	☒	☒	☒	EL	EL	☒	☒	☒	EL	TH/EL	TR/EL	☒	55
Ct-6	TH/EL}	TR/EL	EL	EL	☒	EL	EL	EL	☒	☒	☒	☒	☒									53
Ct-7	TH/EL}	TR/EL	EL	EL	EL	☒	☒	☒	EL	☒	☒	☒	☒	☒								42
																					Average percent of task	48%

*** Indicates tasks involved with climbing turn**

Table 9. Attitude and Judgment Data in Specific Tasks and Skills with El, $\frac{Th}{El}$, $\frac{Tr}{El}$, $\left.\begin{matrix}Th\\El\end{matrix}\right\}$ Effector Outputs

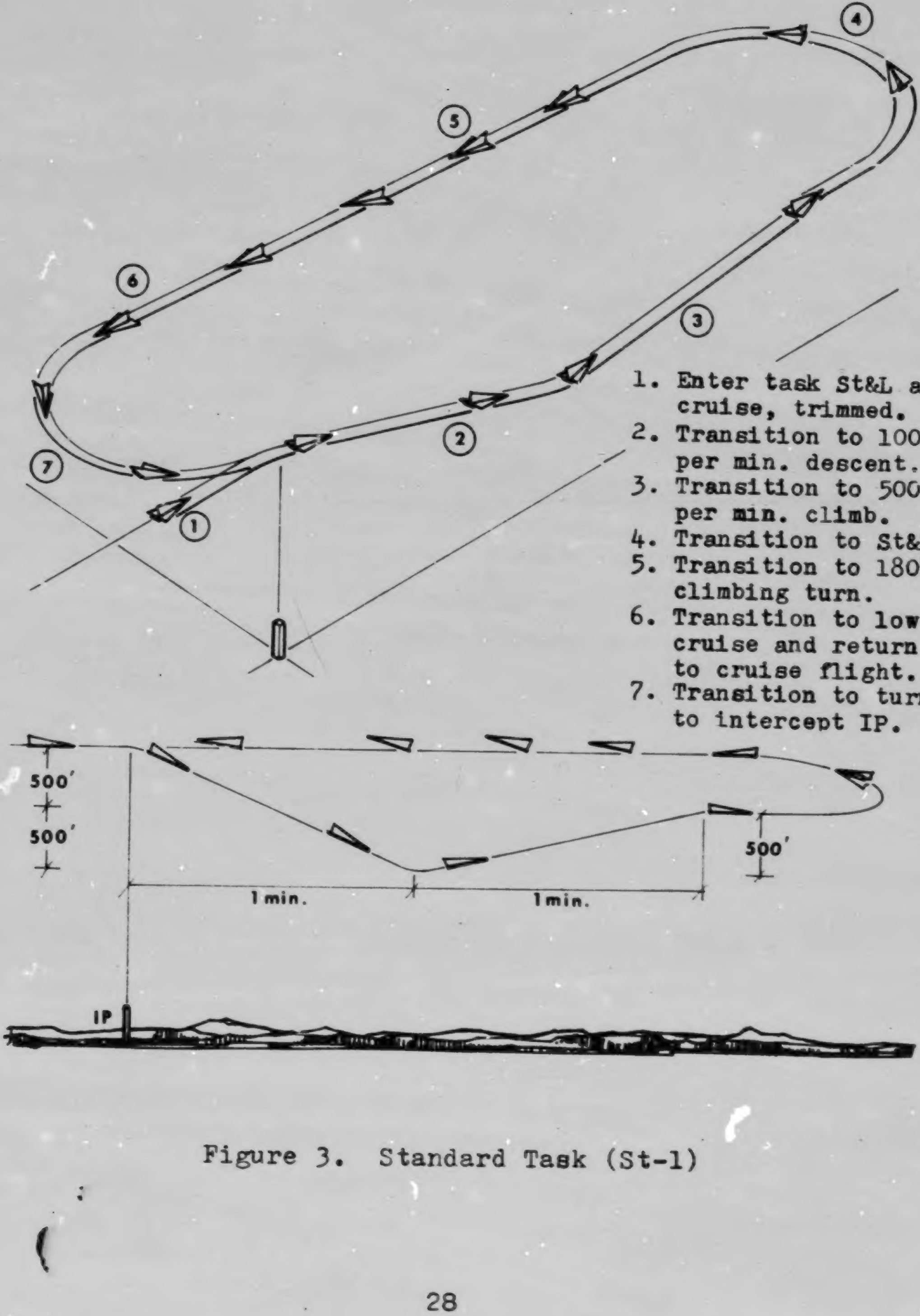
Task	Task and Skill																				
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
F-2	ER SJ	ER CJ	EA CJ	EA SJ																	
F-3	ER SJ	ER CJ	EA CJ	EA SJ																	
F-5	ER SJ	ER CJ	EA CJ	EA SJ																	
F-6	ER SJ	ER CJ	EA CJ	EA SJ																	
F-7	ER SJ	ER CJ	EA SJ	EA SJ																	
F-9	ER SJ	ER CJ	EA CJ	EA SJ																	
F-10	ER SJ	ER CJ	EA SJ	EA SJ																	
F-12	ER SJ	ER CJ	EA SJ	EA SJ																	
F-13	ER SJ	ER CJ	ER SJ	EA SJ																	
F-14	ER SJ	ER CJ	EA SJ	EA SJ																	
Cp-1					ER CJ						ER SJ										
Cp-2				ER SJ						ER CJ							ER CJ	ER CJ	ER CJ	EA CJ	
Cp-3				ER CJ				ER CJ	ER CJ	EA SJ											
Cp-5	ER SJ	ER CJ	EA CJ	EA SJ	ER SJ		EA CJ	ER SJ		EA CJ		EA SJ									
Cp-6	ER SJ	ER CJ	EA CJ	EA CJ	ER SJ	ER SJ	ER CJ	EA CJ	ER CJ	EA SJ	EA SJ	ER SJ	EA CJ								
Cp-8	ER SJ																				
Ct-1	ER SJ	ER SJ	ER SJ	ER CJ		ER CJ	ER CJ	ER SJ	ER CJ			ER SJ		ER SJ							
Ct-3		ER SJ																			
Ct-4	ER SJ	EA CJ	ER J	ER CJ						ER CJ	ER CJ	EA CJ	ER SJ								
Ct-5	ER SJ	EA CJ	ER SJ	ER CJ		ER SJ	ER CJ						ER CJ	ER CJ				ER SJ	ER CJ	EA SJ	
Ct-6	ER SJ	EA CJ	ER SJ	ER CJ		ER CJ	ER CJ	ER CJ													
Ct-7	ER SJ	ER CJ	ER SJ	ER CJ	EA SJ					ER SJ											

Complex Judgment(CJ) - 46%

Simple Judgment(SJ) - 54%

Establish Attitude(EA) - 37%

Estab. Rate of Att. Change(ER) - 79%


④
⑤
⑥
③
⑦
②
①
500′
500′
500′
1 min.
1 min.
IP

1. Enter task St&L at cruise, trimmed.
2. Transition to 1000' per min. descent.
3. Transition to 500' per min. climb.
4. Transition to St&L.
5. Transition to 180° climbing turn.
6. Transition to low cruise and return to cruise flight.
7. Transition to turn to intercept IP.

Figure 3. Standard Task (St-1)

The second standard flying task derived from the analysis was the loop. The circled letter designators illustrated in Figure 4 show the skills in the loop having the candidate effector outputs and their concentration within the aerobatic task.

The loop (Ct-1) located near the bottom of Table 9 shows the relationship of skills containing the specific effector outputs and their concentration within other aerobatic tasks. Notice that 66% of loop skills required those four effector skills. The Cloverleaf (Ct-4), Cuban 8 (Ct-5), Immelmann (Ct-6), and Vertical Recovery (Ct-7) also contained a high concentration of these specific effector skills, thus the loop was identified as a second standard task.

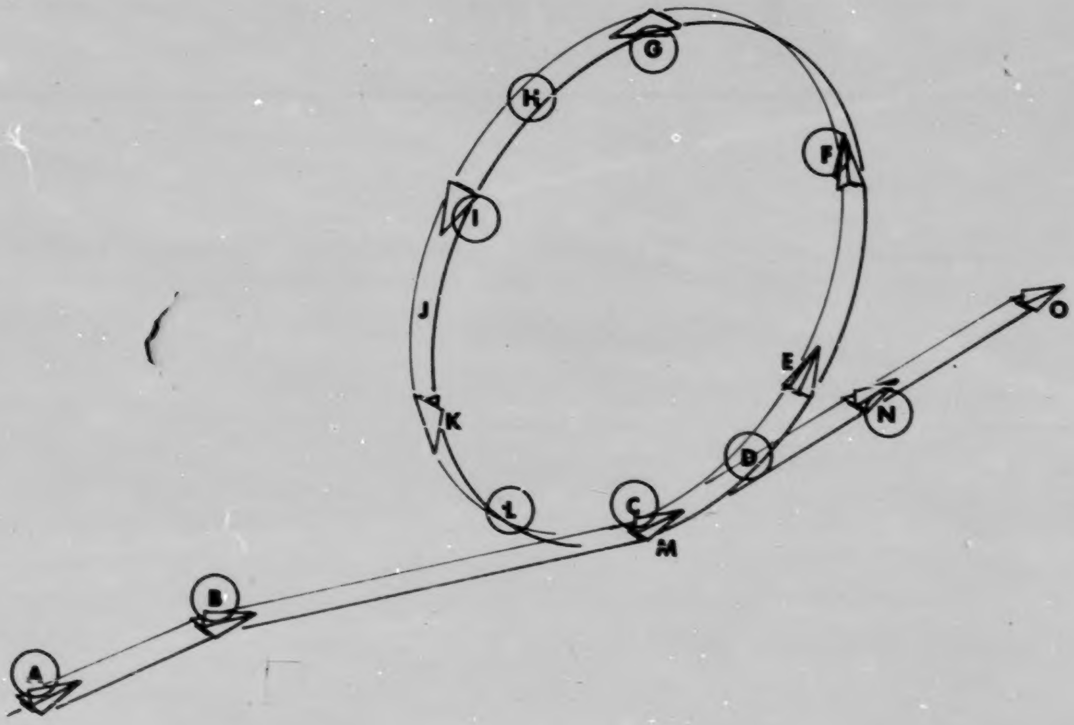


Figure 4. Loop as Standard Task (St-2)

Example Conclusion - The data derived from the taxonomy did not actually create a new standard task for project researchers. However, it did give insight into task requirements and provided some data points upon which to focus. Taxonomy procedures were used to check that the desired skills were part of the new task. This validation was done as the task developed so progress and direction could be calculated. Appendix F shows a surface task analysis of the newly developed standard task (St-1). Skills have been classified and categorized within the taxonomy. Task function data accompanying the analysis shows the proportion of El, $\left.\frac{Th}{El}, \frac{Tr}{El}, \begin{matrix}Th\\El\end{matrix}\right\}$ effector related skills.

Example 4 - Development of a Training Task

The taxonomic system was used to organize skill information to assist in the design and development of a specific training task. This organization of skill data differed from the previous example since the training task must derive requirements from a larger or more complex maneuver. The larger maneuver in this example is the 360° overhead landing. The format for the acquisition and analysis of taxonomy data was similar to that evolved in example three. Since the approach in this example was goal oriented, the original emphasis was on the surface task analysis of Cp-2, the 360° overhead landing which will be referred to in this example as the operational task.

The analysis of the operational task compiled from the taxonomy showed that:

1. Nearly half of the skills required for landing proficiency are not specifically learned prior to the introduction of the landing task.

2. Although fundamental transitional skills are involved in landing, their complex combination makes going from straight fundamentals to the landing task a quantum jump in skill requirements.

3. A landing training task must focus on all aspects of skill proficiency.

4. A landing training task should embody a high concentration of aircraft attitude changing skills and complex judgment factors.

5. The one-of-a-kind skills in the operational task should be stressed in the training task.

Data Acquisition and Analysis - Five data areas were determined to be meaningful for the development of a training task for this operational task.

1. Task/Skill Distribution Within the Operational Task - Skill groups across all tasks in the taxonomy were referenced to each skill in the operational task by noting the slot number at the top right of the coded data in each task sequence in the landing surface analysis found in Appendix G. Each slot number was referenced to the sorting slot content list in Appendix D which shows each skill and skill group within each matrix sorting slot. The resulting data is presented in Table 10 which shows the complete list

Table 10. Task/Skill Distribution Within the Operational Task

Skill	Slot No.	Tasks in Skill Groups
A	162	Cp-2(A), Ct-2(A)
B	145	Cp-1(G), Cp-2(B), Cp-2(C), Cp-2(F), Cp-2(L), Cp-2(O), Cp-7(B), Cp-7(C), Ct-2(H), Ct-7(I)
C	145	Shown in skill(B)
D	166	Cp-2(D)
E	145	Cp-2(E), Cp-8(B), Ct-4(H)
F	145	Shown in skill (B)
G	65	Cp-1(I), Cp-2(G)
H	67	Cp-2(H)
I	62	Cp-2(I)
J	142	Cp-2(J), Cp-2(S), Ct-4(J)
K	145	Cp-2(K)
L	145	Shown in skill (B)
M	110	Cp-2(M), Cp-10(C)
N	150	Cp-2(N)
O	145	Shown in skill (B)
P	30	Cp-2(P)
Q	176	Cp-2(Q)
R	157	Cp-2(R)
S	142	Shown in skill (J)
T	82	Cp-2(T)
U	102	Cp-2(U)

of landing skills and like skills performed in other tasks. This table also shows how many one-of-a-kind skills are involved in the operational task and how proficiency in other tasks in the flying repertoire may affect the possible performance of the landing task. The table also allows access to the skill card file for the investigation of like skills in other tasks as required.

2. Listing of Single Skills Within the Operational Task - This grouping was particularly significant, since 44% of the skills found in this operational task were found nowhere else in the taxonomy. Table 11 shows these skills and their Mental Action decision processing. Notice that six of the ten skills require complex judgment.

Table 11. Single Skills in Slots with Their Decision Processing

Task	Skill	Decision Processing
360° Overhead Landing	(B)	Complex Judgment - CJ
	(C)	CJ
	(D)	Simple Judgment - SJ
	(I)	SJ
	(M)	CJ
	(P)	SJ
	(Q)	CJ
	(R)	CJ
	(U)	CJ
	(V)	SJ

3. Distribution of Specific Behavioral Elements - The grouping of taxonomic data in Table 12 shows the range and concentration of skills by effector output combinations. This table again illustrates the high concentration of complex judgments needed to complete this operational task while also showing that a rate of attitude change is required almost constantly through the entire task performance.

Table 12. Distribution of Specific Behavioral Elements

A. Attitude Control and Decision Processing

	*	*	*					*				*			*	*	*			*	*
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
ER SJ	ER CJ	ER CJ	ER SJ	ER CJ	ER CJ	ER SJ	ER SJ	ER SJ	ER CJ	ER CJ	ER CJ	EA CJ	ER CJ	ER CJ	EA SJ	EA CJ	ER CJ	ER CJ	EA CJ	EA CJ	EA SJ

* Indicates one of a kind skills in Cp-2
EA - 28%, ER - 72%, CJ - 68%, SJ - 32% of task skills

B. Effector Output Combinations

A	Ⓑ	Ⓒ	D	Ⓔ	Ⓕ	Ⓖ	H	I	J	K	Ⓛ	Ⓜ	N	Ⓞ	Ⓟ	Q	R	S	T	U	V
AI RU EL TH	AI RU EL	AI RU EL	EL	AI RU EL	AI RU EL	AI RU EL	00 EL	00 EL	TH EL	AI RU EL 00	AI RU EL	AI RU EL	AI RU TH	AI RU EL	AI RU EL	TH EL	TH EL	TH EL	TH EL	EL 00 00 00	00 RU

○ Indicates skills with $\frac{\left.\begin{matrix}\mathrm{Ai}\\ \mathrm{Ru}\end{matrix}\right\}}{\mathrm{El}}$ Effector Outputs

4. Task/Skill Summary - This summary shows the kind of skill concentration present in the operational task.

a. Ten of twenty-two skills in the operational task are one-of-a-kind skills (those not found in other tasks in the taxonomy). Six of the one-of-a-kind skills require complex judgment.

b. Fifteen of twenty-two skills have complex judgments as decision processing.

c. Eighteen of twenty-two skills establish a rate of attitude change as Motor Action.

d. Nine of twenty-two skills have $\frac{\left.\begin{matrix}\mathrm{Ai}\\ \mathrm{Ru}\end{matrix}\right\}}{\mathrm{El}}$ Effector Outputs.

e. Five of twenty-two skills have $\frac{\mathrm{Th}}{\mathrm{El}}$ Effector Outputs.

f. Two of twenty-two skills have $\frac{\mathrm{00}}{\mathrm{El}}$ Effector Outputs.

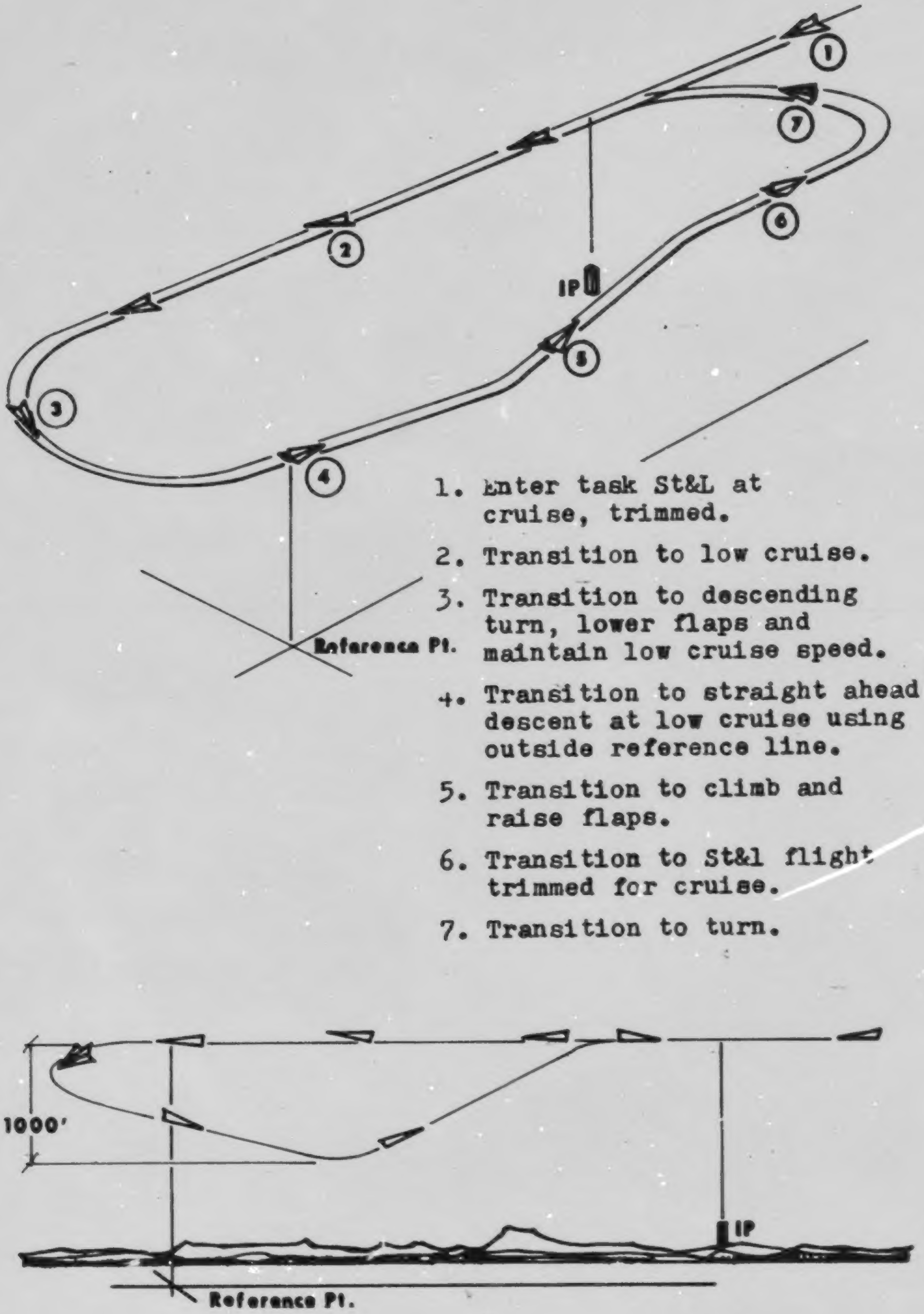
5. Task Distribution of $\frac{\left.\begin{matrix}Ai\\Ru\end{matrix}\right\}}{El}$ Effector Output Combinations - Since it was shown in Table 12-B that nine of the total twenty-two skills involved in the landing also involved coordinated aileron and rudder with elevator outputs, this skill area was investigated further. This was done by pulling all filed skill cards by slot number. Table 13 shows the results of this analysis. Specifically, it shows what skills had any possible connection with this effector output skill and approximately when they occurred in the training syllabus. The occurrence factor was accomplished by consulting the task list and comparing the tasks to their approximate timing in the syllabus.

Table 13. Task Distribution of Effector Outputs

Slot No.	Tasks and Skills	No. of Skills
145.	Cp-1(G)*, Cp-7(B)*, Cp-7(C)*, Cp-8(B) Ct-2(H), Ct-4(H), Ct-7(I)	7
125.	Ct-4(F), Ct-5(H), Ct-5(I), Ct-6(I)	5
60.	F-8(A)*, F-11(A)*, Cp-3(A), Cp-4(A)	4
164.	Cp-3(E), Cp-3(G), Cp-4(E)	3
55.	F-4(A)*, F-1(C)*	2
20.	F-1(A)*, Cp-4(H)	2
25.	Cp-1(M)*	1

* Indicates skills in tasks learned before landing

Task Design and Development - The design and development approach to the training task was essentially the same as the standard task. The analysis of taxonomic data provided project researchers with useful background and decision making information rather than rigid requirements of task structure. Thus, the original training task ideas must rely on creativity based on analysis. Figure 5 shows the results of the landing training task development. Its refinement has been the result of a number of iterations based on the use of the surface analysis and classification described in example three.


1
7
2
6
IP
5
3
4
Reference Pt.
1000'
IP
Reference Pt.

1. Enter task St&L at cruise, trimmed.
2. Transition to low cruise.
3. Transition to descending turn, lower flaps and maintain low cruise speed.
4. Transition to straight ahead descent at low cruise using outside reference line.
5. Transition to climb and raise flaps.
6. Transition to St&l flight trimmed for cruise.
7. Transition to turn.

Figure 5. Landing Training Task (St-3)

The new training task contains thirty-two skills as processed through the taxonomic structure. These skills accounted for 79% of the skills present in the 360° circling approach to landing. The remaining skills in the training task were used to exercise a go-around-type procedure and turn which placed the aircraft in proper position to repeat the task. This standard training task was considered successful since it contained a high percentage of skills directly related to the landing.

Example Conclusions - The landing training task, like the new standard task, was the expression of a beginning of task design and development rather than the end. It should be possible, however, to extend the usefulness of the taxonomy through further application. Likewise, it should also be possible for the future training specialist to develop and refine effective candidate tasks with a high level of confidence through the continued use of the taxonomy analysis and synthesis routines.

CONCLUDING STATEMENT

The taxonomy developed during this research effort is a unique tool which can be applied to all flying tasks. It is not a solution, but rather an aid to understanding the basic requirements of flying; thus, it can influence flying training.

The taxonomy reduced current UPT flying tasks into individual basic skills. While individual skill training is not possible, skills in the examples described in this report were organized into more logical flying sequences for training. The new tasks may or may not bear a resemblance to current training maneuvers. They should, however, contain the essence of operational tasks. Through a set of logical steps, current as well as future training requirements could be converted to new and more logically designed flying training tasks.

The first step to such a reorganization would be the analysis and classification of all pertinent maneuvers into the taxonomic data system. The resultant basic skills and skill groupings would become the building blocks for all subsequent new task development. Table 14 shows the flying skills organized into categories and the manner in which they were associated to form the basis of a related skill structure. This table also shows the relationship between the skill categories and actual flying task characteristics. Essentially, basic skills are linked together to form intermediary skills. These skills form the fundamental transitional flying tasks. They are relatively simple activities and could be reduced to power control, attitude control, altitude control and directional control tasks. Each of these four task areas could be designed as training tasks in the specific context of the first important operational milestone of flying training - the safe execution of takeoffs and landings.

The procedural skills, shown in Table 14, link together a number of specific intermediary skills into a meaningful series to form a composite transitional task. The composite tasks contain the majority of normal flying maneuvers. Other tasks such as aerobatics are considered continuous transitional tasks.

Specialized skills were divided into two classes. The first class was the specialized primary skills which linked together intermediary and procedural skills and extended them into the unusual attitudes of aerobatic flight. The specialized advanced skills linked together intermediary and procedural skills with the primary specialized skills to perform the most complex of continuous transitional tasks.

Table 14. The Relationship of Flying Task Characteristics and Flying Skill Categories

FLYING TASK CHARACTERISTICS	FLYING SKILL CATEGORIES
A. Fundamental Transitional Tasks - The twelve control segments derived from the four steady-state flight paths, Straight-and Level (St & L), Turn (T), Climb (C), and Descent (D): 1. St & L → T 2. St & L → C 3. St & L → D 4. T → St & L 5. T → C 6. T → D 7. C → St & L 8. C → T 9. C → D 10. D → St & L 11. D → T 12. D → C The Fundamental Transitional Task is the smallest task part.	A-1 Basic Skills - The linking together of behavioral elements into meaningful* C - Me - Mo sequences in a task. This is the smallest part of the skill structure. A-2 Intermediary Skills - The linking together of basic skills into a meaningful series to form a task. This grouping of skills is found with the Fundamental Transitional Task.
B. Composite Transitional Tasks - Two or more fundamental transitional tasks combined to perform a more complex flying requirement. The following are examples of Composite Tasks: 1. Take-Offs 2. Climb-Outs 3. Cross Country Flying 4. Approaches 5. Landings 6. Lazy-8's 7. Chandelles 8. Stalls 9. Spins 10. Formation Flying	B-1 Procedural Skills - The linking together of a number of meaningful intermediary skills to form a larger task. This grouping of skill combinations is found within the Composite Transitional Tasks.
C. Continuous Transitional Tasks - Any number of fundamental and composite tasks combined in rapid succession to complete a complex flight requirement. Continuous Transitional Tasks are divided into Primary and Advanced tasks. The following are examples: Primary 1. Loops 2. Barrel Rolls 3. Aileron Rolls Advanced 1. Clover Leafs 2. Cuban 8's 3. Immelmanns	C-1 Specialized Primary Skills - The linking together of Intermediary and Procedural skills into a meaningful unusual attitude sequence within a task. This grouping of skills is found in Primary Continuous Transitional Tasks. C-2 Specialized Advanced Skills - The linking together of a number of meaningful Procedural and Primary Specialized skills. This grouping of skill combinations is found within Advanced Continuous Transitional Tasks.

*Meaningful - a significant pattern of activity used in the execution of a task.

This skill building concept, through a logical progression from simple to complex tasks, would produce an efficient "train what is needed" approach as opposed to the present training task sequence. By attaining superior efficiency; time, money and energy savings can be obtained. Further, the precise task requirements derived from a detailed skill analysis would reduce uncertainty and frustration for both student and instructor. Learning and remediation would be easier for students as objectives could be clearly stated in units which could be easily mastered.

A concept such as this would lend itself to increased use of the simulator in flying training in areas other than instrument instruction. Specifically, training tasks done to acquire skills needed to accomplish specific operational tasks would provide a logical use and placement of a simulation program in all flying training. Only the operational tasks would theoretically need to be flown in the actual aircraft. Much of the role of simulation in this concept would rest on the capabilities of future simulators considered for the future undergraduate pilot training program. Another aspect is that the training tasks would have an almost one-to-one correspondence with the segments of the operational tasks. Thus, an instructor would know exactly what tasks would need to be mastered by the student.

This approach to the acquisition of flying skills is applicable to both current and future flying training. The taxonomy could be used as an analytical tool to determine operational task requirements in flying training. It would also play a meaningful role in the establishment of specific tasks which reflected operational needs. Changes to the concept could be easily implemented so that once established it could be updated as required. The taxonomy could be used to derive skills for any new training requirement and would also be available to assist in the development of new tasks.

APPENDIX A

SURFACE ANALYSES - INSTRUMENT TASKS

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. Fi-1 **TASK** Straight and level/transition to coordinated constant altitude turn (30° bank)

TASK GOAL To establish constant bank, constant altitude turn **DATE** July, 1974

NOTE: A/S decrease in 30° bank negligible & not perceptible (NP)

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(A)	BEGINS TURN		Fi-1 (A) 60 1 V 1-C T-8 2 L-4 RP SJ 3 ER Al Ru EL R-S
1.	Visual ADI- Pitch: cruise Bank: level Tach- constant HSI- constant T/S- str. & wings level A/S- constant VV - level Alt- constant Aural-Normal envir. sound Control-Neutral pressure Motion-Normal G		
2.		Anticipates transition to 30° bank turn	
3.			Coordinates aileron & rudder, increases elevator pressure
(B)	STARTS ROLL		Fi-1 (B) 150 1 V CM 3-C T-11 2 L-4 MC CJ 3 ER Al Ru EL R-S
1.	Visual ADI- Pitch: increase Bank: rolling HSI- turn initiated T/S- coordinated turn initiated Remainder Constant Aural-Normal envir. sound Control-Increased aileron, rudder & elevator pressure Motion-Positive G onset		
2.		Determines satisfactory roll rate	
3.			Maintains coordinated aileron & rudder pressure, increases elevator pressure

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. Fi-1 **TASK** Straight and level/transition to coordinated constant altitude turn (30° bank)

TASK GOAL To establish constant bank, constant altitude turn **DATE** July, 1974

NOTE: A/S decrease in 30° bank negligible & not perceptible (NP)

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(C)	CONTINUES ROLL		
1.	Visual ADI- Pitch: increase Bank: rolling HSI- turn T/S- coordinated turn rate increasing Remainder Constant Aural-Normal envir. sound Control-Constant aileron & rudder pressure, incr. elevator pres. Motion-Increasing pos. G		Fi-1(C) 27 1 V CM 3-C T-11 2 L-2 MC SJ 3 EA AI/RU/EL R-2
2.		Determines proper bank attitude approaching	
3.			Moves aileron, relaxes rudder pres. & maintains elevator pressure
(D)	STOPS ROLL		
1.	Visual ADI- Pitch: nose high Bank: 30° HSI- turn T/S- coordinated turn rate stabilized Remainder constant Aural-Normal envir. sound Control-Neutral aileron & rudder pressure, constant elevator pressure Motion-Constant pos. G		Fi-1(D) 27 1 V CM 3-C T-9 2 L-2 MC SJ 3 EA TR/EL R-2
2.		Determines trim required	
3.			Adjusts trim & relaxes elevator pressure

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. Fi-1 TASK Straight and level/transition to coordinated constant altitude turn (30°)

TASK GOAL To establish constant bank, constant altitude turn DATE July, 1974

NOTE: A/S decrease in 30° bank negligible & not perceptible (NP)

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(E)	ESTABLISHES STEADY-STATE		FI-1 (E) O 1 V M 2-C T-8 2 L-1 MC SJ 3 EA — —
1.	Visual ADI- Pitch: nose high Bank: constant 30° Tach- constant HSI- turn T/S- coordinated turn Remainder constant Aural-Normal envir. sound Control-Neutral pressure Motion-Constant pos. G		
2.		Determines goal is established	
3.			Maintains turn control

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. Fi-2 **TASK** Straight and level flight/ transition to straight ahead climb

TASK GOAL To establish constant speed climb **DATE** July, 1974

NOTE: Climb speed lower than cruise speed

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(A)	BEGINS CLIMB		
1.	Visual ADI- Pitch: cruise Bank: level Tach- constant HSI- constant T/S- str. & wings level A/S- constant VV - level Alt- constant Aural-Normal envir. sound Control-Neutral pressure Motion-Normal G		Fi-2 (A) 56 1 V 1-C T-8 2 L-2 RP ST 3 ER EL R-1
2.		Anticipates transition to climb	
3.			Moves elevator
(B)	STARTS PITCH INCREASE		
1.	Visual ADI- Pitch: increasing Bank: level A/S- decreasing VV - climb rate initiated Alt- climb Remainder Constant Aural-Normal envir. sound Control-Incr. elevator pres. Motion-Positive G onset, pitching up		Fi-2 (B) 46 1 V CM 3-C T-10 2 L2 MC CT 3 ER EL R-1
2.		Determines satisfactory pitch attitude movement	
3.			Maintains constant elevator pressure

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. Fi-2 TASK Straight and level flight/ transition to straight ahead climb

TASK GOAL To establish constant speed climb DATE July, 1974

NOTE: Climb speed lower than cruise speed

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(C)	CONTINUES PITCH INCREASE		Fi-2 (C) 26 1 V CM 3-C T-10 2 L-2 MC ST 3 EA EL R-1
1.	Visual ADI- Pitch: increasing Bank: level A/S- decreasing VV - climb Alt- climb Remainder Constant Aural-Normal envir. sound Control-Constant elevator pressure Motion-Constant pos. G, pitching up		
2.		Determines climb attitude approach.	
3.			Relaxes elevator pressure
(D)	STOPS PITCH INCREASE		Fi-2 (D) 163 1 V CM 3-C T-10 2 L-2 SC SJ 3 EA TH R-1
1.	Visual ADI- Pitch: climb Bank: level A/S- decreasing VV - climb Alt- climb Remainder Constant Aural-Normal envir. sound Control-Decreased elevator pressure Motion-Decreasing pos. G, pitch stabilized		
2.		Observes climb speed approaching	
3.			Adjusts throttle

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. Fi-2 **TASK** Straight and level flight/ transition to straight ahead climb

TASK GOAL To establish constant speed climb **DATE** July, 1974

NOTE: Climb speed lower than cruise speed

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(E) 1.	ADJUSTS POWER Visual ADI- Pitch: climb Bank: level Tach- climb power A/S- constant VV - constant rate climb Alt- climb Remainder Constant Aural-Change in envir. sound Control-Constant elevator pressure & throttle increase Motion-Normal G		Fi-2 (E) 27 1 VA C 3-C T-10 2 L-2 MC SJ 3 EA TR/EL R-2
2.		Determines trim required	
3.			Adjusts trim & relaxes elevator pressure
(F) 1.	ESTABLISHES STEADY-STATE Visual ADI- Pitch: climb Bank: level VV - constant rate climb Alt- climb Remainder Constant Aural-Normal envir. sound Control-Neutral pressure Motion-Normal G		Fi-2(F) 0 1 V 1-C T-8 2 L-1 MC SJ 3 EA — —
2.		Determines goal is established	
3.			Maintains climb control

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. Fi-3 **TASK** Straight and level flight/transition to straight ahead cruise descent

TASK GOAL To establish constant speed straight ahead cruise descent **DATE** July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(A)	BEGINS DESCENT		Fi-3 (A) 58 1 V 1-C T-8 2 L-3 RP SJ 3 ER EL/TH R-3
1.	Visual ADI- Pitch: cruise Bank: level Tach- constant HSI- constant T/S- str. & wings level A/S- constant VV - level Alt- constant Aural-Normal envir. sound Control-Neutral pressure Motion-Normal G		
2.		Anticipates transition to constant apeed descent	
3.			Coordinates elevator & throttle adjustment
(B)	STARTS PITCH DECREASE		Fi-3 (B) M2 1 V A C M 4-C T-12 2 L-2 MC CJ 3 ER EL/TH R-2
1.	Visual ADI- Pitch: decreasing Bank: level Tach- decreasing rpm VV - descent rate initiated Alt- descent Remainder constant Aural-Change in envir. sound Control-Increased elevator pressure & throttle reduction Motion-Negative G onset, pitching down		
2.		Determines satisfactory pitch attitude movement	
3.			Maintains constant elevator pressure and continues throttle adjustment

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. Fi-3 **TASK** Straight and level flight/transition to straight ahead cruise descent

TASK GOAL To establish constant speed straight ahead cruise descent **DATE** July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(C) 1.	CONTINUES PITCH DECREASE Visual ADI- Pitch: decreasing Bank: level Tach- decreasing rpm VV - descent Alt- descent Remainder Constant Aural-Change in envir. sound Control-Constant elevator pressure & throttle reduction Motion-Constant negative G, pitching down		Fi-3 (C) 22 1 VA CM 4-C T-12 2 L2 MC SJ 3 EA EL/TH R2
2.		Determines descent attitude approaching	
3.			Relaxes elevator pressure & stops throttle adjustment
(D) 1.	STOPS PITCH DECREASE Visual ADI- Pitch: descent Bank: level VV - constant rate descent Alt- descent Remainder Constant Aural-Normal envir. sound Control-Decreased elevator pressure Motion-Decreasing negative G, pitch stabilized		Fi-3 (D) 21 1 V CM 3-C T-10 2 L2 MC SJ 3 EA TR/EL R2
2.		Determines trim required	
3.			Adjusts trim & relaxes elevator pressure

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. Fi-3 **TASK** Straight and level flight/transition to straight ahead cruise descent

TASK GOAL To establish constant speed straight ahead cruise descent **DATE** July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(E) 1.	ESTABLISHES STEADY-STATE Visual ADI- Pitch: descent Bank: level VV - constant rate descent Alt- descent Remainder Constant Aural-Normal envir. sound Control-Neutral pressure Motion-Normal G		Fi-5(E) 0 1 V 1-C T- 2 L-1 MC SJ 3 EA — —
2.		Determines goal is established	
3.			Maintains descent control

SITUATION Aircraft in 30° bank, constant altitude, constant speed turn

TASK NO. Fi-4 **TASK** 30° bank turn transition to wings level flight

TASK GOAL To establish straight & level flight from a turn **DATE** July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(A) 1.	BEGINS ROLL OUT Visual ADI- Pitch: nose high Bank: 30° Tach- constant HSI- turn T/S- coordinated turn A/S- constant VV - level Alt- constant Aural-Normal envir. sound Control-Neutral pressure Motion-Constant positive G		Fi-4 (A) 55 1 V M 2-C T-9 2 L-4 RP SJ 3 ER AI RU } EL R-S
2.		Anticipates rolling out of turn	
3.			Coordinates aileron & rudder, increases elevator pressure
(B) 1.	STARTS ROLL Visual ADI- Pitch: decrease Bank: rolling HSI- turn T/S- coordinated turn rate decreasing Remainder Constant Aural-Normal envir. sound Control-Increased aileron, rudder & elevator pressure Motion-Decreasing positive G		Fi-4 (B) 150 1 V CM 3-C T-11 2 L-4 MC CJ 3 ER AI RU } EL R-S
2.		Determines satisfactory roll rate	
3.			Maintains coordinated aileron & & rudder pressure, increases elevator pressure

SITUATION Aircraft in 30° bank, constant altitude, constant speed turn

TASK NO. Fi-4 **TASK** 30° bank turn transition to wings level flight

TASK GOAL To establish straight & level flight from a turn **DATE** July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(C)	CONTINUES ROLL		Fi-4(C) 27 1 V CM 3-C T-11 2 L-2 MC SJ 3 EA AI/RU/EL R-2
1.	Visual ADI- Pitch: decrease Bank: rolling HSI- turn T/S- coordinated turn rate decreasing Remainder Constant Aural-Normal envir. sound Control-Constant aileron & rudder pressure, increased elevator pressure Motion-Decreasing positive G		
2.		Determines wings level attitude approaching	
3.			Moves aileron, relaxes rudder pres., & maintains elevator pressure
(D)	STOPS ROLL		Fi-4 (D) 32 1 V C 2-C T-9 2 L2 MC SJ 3 EA TR/EL R-2
1.	Visual ADI- Pitch: cruise Bank: level HSI- turn stopped T/S- str. & wings level Remainder Constant Aural-Normal envir. sound Control-Neutral aileron & rudder pressure, constant elevator pressure Motion-Normal G		
2.		Determines trim required	
3.			Adjusts trim & relaxes elevator pressure

SITUATION Aircraft in 30° bank, constant altitude, constant speed turn

TASK NO. Fi-4 TASK 30° bank turn transition to wings level flight

TASK GOAL To establish straight & level flight from a turn DATE July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(E)	ESTABLISHES STEADY-STATE		Fi-4(E) 0 1 V 1-C T-8 2 L-1 MC SJ 3 EA — —
1.	Visual ADI- Pitch: cruise Bank: level T/S- str. & wings level Remainder Constant Aural-Normal envir. sound Control-Neutral pressure Motion-Normal G		
2.		Determines goal is established	
3.			Maintains cruise control

SITUATION Aircraft in 30° bank, constant altitude, constant speed turn

TASK NO. Fi-5 TASK 30° bank, constant altitude turn/ transition to climb

TASK GOAL To establish climbing turn DATE July, 1974

NOTE: Climb speed lower than cruise speed

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(A)	BEGINS CLIMB		F1-5 (A) 51 1 V M 2-C T-9 2 L-2 RF SJ 3 ER EL R-1
1.	Visual ADI- Pitch: nose high Bank: constant 30° Tach- constant HSI- turn T/S- coordinated turn A/S- constant VV - constant Alt- constant Aural-Normal envir. sound Control-Neutral pressure Motion-Constant positive G		
2.		Anticipates transition to climb	
3.			Moves elevator
(B)	STARTS PITCH INCREASE		F1-5 (B) 46 1 V CM 3-C T-11 2 L-2 MC CJ 3 ER EL R-1
1.	Visual ADI- Pitch: increasing Bank: constant 30° Tach- decreasing rpm HSI- turn T/S- coordinated turn rate increasing A/S- decreasing VV - climb rate initiated Alt- climb Aural-Normal envir. sound Control-Increased elevator pressure Motion-Increasing positive G, pitching up		
2.		Determines satisfactory pitch attitude movement	
3.			Maintains constant elevator pressure

SITUATION Aircraft in 30° bank, constant altitude, constant speed turn

TASK NO. Fi-5 **TASK** 30° bank, constant altitude turn/ transition to climb

TASK GOAL To establish climbing turn **DATE** July, 1974

NOTE: Climb speed lower than cruise speed

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(C) 1.	CONTINUES PITCH INCREASE Visual ADI- Pitch: increasing Bank: constant 30° Tach- decreasing rpm HSI- turn T/S- coordinated turn rate increasing A/S- decreasing VV - climb Alt- climb Aural-Normal envir. sound Control-Increased elevator pressure Motion-Constant positive G, pitching up		Fi-5(C) 26 1 CM 3-C T-11 2 L-2 MC SJ 3 EA EL R-1
2.		Determines climb attitude approach.	
3.			Relaxes elevator pressure
(D) 1.	STOPS PITCH INCREASE Visual ADI- Pitch: nose high Bank: constant 30° Tach- constant HSI- turn T/S- coordinated turn A/S- decreasing VV - climb Alt- climb Aural-Normal envir. sound Control-Decreased elevator pressure Motion-Decreasing positive G, pitch stabilized		Fi-5 (D) [illegible] 1 CM S-C T-11 2 L-2 SC SJ 3 EA TH R-1
2.		Observes climb speed approaching	
3.			Adjusts throttle

SITUATION Aircraft in 30° bank, constant altitude, constant speed turn

TASK NO. Fi-5 **TASK** 30° bank, constant altitude turn/ transition to climb

TASK GOAL To establish climbing turn **DATE** July, 1974

NOTE: Climb speed lower than cruise speed

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(E) 1.	ADJUSTS POWER Visual ADI- Pitch: nose high Bank: constant 30° Tach- climb power HSI- turn T/S- coordinated turn A/S- constant VV - constant rate climb Alt- climb Aural-Change in envir. sound Control-Constant elevator pressure & throttle increase Motion-Constant positive G		Fi-5 (E) 22 1 VA CM 4-C T-11 2 L-2 MC SJ 3 EA TR/EL R-2
2.		Determines trim required	
3.			Adjusts trim & relaxes elevator pressure
(F) 1.	ESTABLISHES STEADY-STATE Visual ADI- Pitch: nose high Bank: constant 30° Tach- constant HSI- turn T/S- coordinated turn A/S- constant VV - constant rate climb Alt- climb Aural-Normal envir. sound Control-Neutral pressure Motion-Constant positive G		Fi-5 (F) 9 1 V M 2-C T-8 2 L-1 MC SJ 3 EA — —
2.		Determines goal is established	
3.			Maintains climb control

SITUATION Aircraft in 30° bank, constant altitude turn at constant speed

TASK NO. Fi-6 **TASK** 30° bank, constant altitude turn/cruise descent transition to

TASK GOAL To establish descending turn from constant altitude turn **DATE** July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(A)	BEGINS DESCENT		Fi-6 (A) 53 1 V M 2-C T-8 2 L-3 RP SJ 3 ER EL THS R-3
1.	Visual ADI- Pitch: nose high Bank: constant 30° Tach- constant HSI- turn T/S- coordinated turn A/S- constant VV - constant Alt- constant Aural-Normal envir. sound Control-Neutral pressure Motion-Constant positive G		
2.		Anticipates transition to constant speed descent	
3.			Coordinates elevator & throttle adjust.
(B)	STARTS PITCH DECREASE		Fi-6 (B) 42 1 VA CM 4-C T-12 2 L-2 MC CJ 3 ER EL TH R-2
1.	Visual ADI- Pitch: decreasing Bank: constant 30° Tach- decreasing rpm HSI- turn T/S- coordinated turn A/S- constant VV - descent rate initiated Alt- descent Aural-Change in envir. sound Control-Increased elevator pressure & throttle reduction Motion-Decreasing positive G, pitching down		
2.		Determines satisfactory pitch attitude movement	
3.			Maintains constant elevator pressure & continues throttle adjustment

SITUATION Aircraft in 30° bank, constant altitude turn at constant speed

TASK NO. Fi-6 **TASK** 30° bank, constant altitude turn/cruise descent transition to

TASK GOAL To establish descending turn from constant altitude turn **DATE** July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(C)	CONTINUES PITCH DECREASE		Fi-6 (C) 22
1.	Visual ADI- Pitch: decreasing Bank: constant 30° Tach- decreasing rpm HSI- turn T/S- coordinated turn A/S- constant VV - descent Alt- descent Aural-Change in envir. sound Control-Constant elevator pressure & throttle reduction Motion-Decreasing positive G, pitching down		1 VA CM 4-C T-12 2 L-2 MC SJ 3 EA EL/TH 2-2
2.		Determines descent attitude approach.	
3.			Relaxes elevator pressure & stops throttle adjustment
(D)	STOPS PITCH DECREASE		Fi-6 (D) 27
1.	Visual ADI- Pitch: nose low Bank: constant 30° Tach- constant HSI- turn T/S- coordinated turn A/S- constant VV - constant rate descent Alt- descent Aural-Normal envir. sound Control-Decreased elevator pressure Motion-Normal G, pitch stabilized		1 V CM 3-C T-10 2 L-2 MC SJ 3 EA TC/EL R-2
2.		Determines trim required	
3.			Adjusts trim & relaxes elevator pres.

SITUATION Aircraft in 30° bank, constant altitude turn at constant speed

TASK NO. Fi-6 **TASK** 30° bank, constant altitude turn/cruise descent transition to

TASK GOAL To establish descending turn from constant altitude turn **DATE** July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(E)	ESTABLISHES STEADY STATE		Fi-6 (E) 0 1 V 1-C T-8 2 L-2 MC SJ 3 EA — —
1.	Visual ADI- Pitch: nose low Bank: constant 30° Tach- constant HSI- turn T/S- coordinated turn A/S- constant VV - constant rate descent Alt- descent Aural-Normal envir. sound Control-Neutral pressure Motion-Normal G		
2.		Determines goal is established	
3.			Maintains descent control

SITUATION Aircraft climbing at constant airspeed on constant heading

TASK NO. Fi-7 **TASK** Straight ahead climb/transition to straight and level flight

TASK GOAL To establish straight & level cruise flight **DATE** July, 1974

NOTE: Cruise speed higher than climb speed

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(A)	BEGINS LEVEL OFF		Fi-7(A) 56 1 V 1-C T-8 2 L-2 RP SJ 3 ER EL R-1
1.	Visual ADI- Pitch: climb Bank: level Tach- climb power HSI- constant T/S- str. & wings level A/S- constant VV - constant rate climb Alt- climb Aural-Normal envir. sound Control-Neutral pressure Motion-Normal G		
2.		Anticipates transition to level flight	
3.			Moves elevator
(B)	STARTS PITCH DECREASE		Fi-7(B) 146 1 ✓ CM 3-C T-10 2 L-2 MC CJ 3 ER EL R-1
1.	Visual ADI- Pitch: decreasing Bank: level A/S- increasing VV - climb rate decreasing Alt- climb Remainder constant Aural-Normal envir. sound Control-Increased elevator pressure Motion-Negative G onset, pitching down		
2.		Determines satisfactory pitch attitude movement	
3.			Maintains constant elevator pressure

SITUATION Aircraft climbing at constant airspeed on constant heading

TASK NO. Fi-7 **TASK** Straight ahead climb/transition to straight and level flight

TASK GOAL To establish straight & level cruise flight **DATE** July, 1974

NOTE: Cruise speed higher than climb speed

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(C)	CONTINUES PITCH DECREASE		
1.	Visual ADI- Pitch: decreasing Bank: level A/S- increasing VV - climb rate decreasing Alt- climb Remainder Constant Aural-Normal envir. sound Control-Constant elevator pressure Motion-Constant negative G, pitching down		Fi-7 (C) 26 1 V CM 3-C T-10 2 L-2 MC SJ 3 EA EL R-1
2.		Determines cruise attitude approaching	
3.			Relaxes elevator pressure
(D)	STOPS PITCH DECREASE		
1.	Visual ADI- Pitch: cruise Bank: level A/S- increasing VV - level Remainder Constant Aural-Normal envir. sound Control-Decreased elevator pressure Motion-Normal G, pitch stabilized		Fi-7 (D) 163 1 V CM 3-C T-10 2 L-2 SC SJ 3 EA TH R-1
2.		Observes cruise speed approaching	
3.			Adjusts throttle

SITUATION Aircraft climbing at constant airspeed on constant heading

TASK NO. Fi-7 **TASK** Straight ahead climb/transition to straight and level flight

TASK GOAL To establish straight & level cruise flight **DATE** July, 1974

NOTE: Cruise speed higher than climb speed

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(E) 1.	ADJUSTS POWER Visual ADI- Pitch: cruise Bank: level Tach- cruise power VV - level Remainder Constant Aural-Change in envir. sound Control-Constant elevator pressure & throttle decrease Motion-Normal G		Fi-7(E) 27 1 V A C 3-C T-10 2 L-2 MC SJ 3 EA TR/EL R-2
2.		Determines trim required	
3.			Adjusts trim & relaxes elevator pressure
(F) 1.	ESTABLISHES STEADY-STATE Visual ADI- Pitch: cruise Bank: level VV - level Remainder Constant Aural-Normal envir. sound Control-Neutral pressure Motion-Normal G		Fi-7(F) 0 1 V 1-C T-8 2 L-1 MC SJ 3 EA — —
2.		Determines goal is established	
3.			Maintains cruise control

SITUATION Aircraft climbing at constant airspeed on constant heading

TASK NO. Fi-8 **TASK** Straight ahead climb/transition to coordinated climbing turn - 30° bank

TASK GOAL To establish climbing turn **DATE** July, 1974

NOTE: A/S decrease in 30° bank negligible & not perceptible (NP)

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(A)	BEGINS TURN		Fi-8 (A) 60 1 V 1-C T-8 2 L-4 RP SJ 3 ER Al RU / EL R-S
1.	Visual ADI- Pitch: climb Bank: level Tach- constant HSI- constant T/S- str. & wings level A/S- constant VV - constant rate climb Alt- climb Aural-Normal envir. sound Control-Neutral pressure Motion-Normal G		
2.		Anticipates transition to 30° bank turn	
3.			Coordinates aileron &·rudder, increases elevator pressure
(B)	STARTS ROLL		Fi-8 (B) 150 1 V CM 3-C T-11 2 L-4 MC CJ 3 ER Al RU / EL R-S
1.	Visual ADI- Pitch: climb Bank: rolling HSI- turn initiated T/S- coordinated turn initiated VV - climb rate decrease NP Alt- climb Remainder constant Aural-Normal envir. sound Control-Increased aileron, rudder & elevator pressure Motion-Positive G onset		
2.		Determines satisfactory roll rate	
3.			Maintains coordinated aileron & rudder pressure, incr. elevator pres.

SITUATION Aircraft climbing at constant airspeed on constant heading

TASK NO. Fi-8 **TASK** Straight ahead climb/transition to coordinated climbing turn - 30° bank

TASK GOAL To establish climbing turn **DATE** July, 1974

NOTE: A/S decrease in 30° bank negligible & not perceptible (NP)

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(C)	CONTINUES ROLL		
1.	Visual ADI- Pitch: climb Bank: rolling HSI- turn T/S- coordinated turn rate increasing VV - climb rate decrease NP Alt- climb Remainder Constant Aural-Normal envir. sound Control-Constant aileron & rudder pressure, incr. elevator pres. Motion-Increasing positive G		Fi-8 (C) 27 1 V CM 3-C T-11 2 L-2 MC SJ 3 EA AL RU EL R2
2.		Determines proper bank attitude approaching	
3.			Moves aileron, relaxes rudder pressure & maintains elevator pressure
(D)	STOPS ROLL		
1.	Visual ADI- Pitch: climb Bank: 30° HSI- turn T/S- coordinated turn rate stabilized Alt- climb Remainder Constant Aural-Normal envir. sound Control-Neutral aileron & rudder pressure, constant elevator pressure Motion-Constant positive G		Fi-8 (D) 27 1 V CM 3-C T-9 2 L-2 MC SJ 3 EA TR EL R2
2.		Determines trim required	
3.			Adjusts trim & relaxes elevator pres.

SITUATION Aircraft climbing at constant airspeed on constant heading

TASK NO. Fi-8 **TASK** Straight ahead climb/transition to coordinated climbing turn - 30° bank

TASK GOAL To establish climbing turn **DATE** July, 1974

NOTE: A/S decrease in 30° bank negligible & not perceptible (NP)

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(E)	ESTABLISHES STEADY-STATE		
1.	Visual ADI- Pitch: climb Bank: constant 30° HSI- turn T/S- coordinated turn Alt- climb Remainder Constant Aural-Normal envir. sound Control-Neutral pressure Motion-Constant positive G		
2.		Determines goal is established	
3.			Maintains turn control

SITUATION Aircraft climbing at constant airspeed on constant heading

TASK NO. Fi-9 **TASK** Straight ahead climb/transition to straight ahead descent at constant airspeed

TASK GOAL To establish straight ahead descent **DATE** July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(A)	BEGINS DESCENT		
1.	Visual ADI- Pitch: climb Bank: level Tach- constant HSI- constant T/S- str. & wings level A/S- constant VV - constant rate climb Alt- climb Aural-Normal envir. sound Control-Neutral pressure Motion-Normal G		Fi-9(A) 58 1 V 1-2 T-8 2 L3 RP SJ 3 ER EL/THS R3
2.		Anticipates transition to constant speed descent	
3.			Coordinates elevator & throttle adjust.
(B)	STARTS PITCH DECREASE		
1.	Visual ADI- Pitch: decreasing Bank: level Tach- decreasing rpm VV - climb rate decreasing Alt- climb Remainder Constant Aural-Change in envir. sound Control-Increased elevator pressure & throttle reduction Motion-Negative G onset, pitching down		Fi9 (B) 42 1 VA CM 4-2 T12 2 L2 M2 SJ 3 EK EL/TH R2
2.		Determines satisfactory pitch attitude movement	
3.			Maintains constant elevator pressure & continues throttle adjustment

SITUATION Aircraft climbing at constant airspeed on constant heading

TASK NO. Fi-9 **TASK** Straight ahead climb/transition to straight ahead descent at constant airspeed

TASK GOAL To establish straight ahead descent **DATE** July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(C) 1.	CONTINUES PITCH DECREASE Visual ADI- Pitch: decreasing Bank: level Tach- decreasing rpm VV - descent rate incr. Alt- descent Remainder Constant Aural-Change in envir. sound Control-Constant elevator pressure & throttle reduction Motion-Constant negative G, pitching down		Fi-9 (C) 22 1 VA CM 4C T-12 2 L-2 MC SJ 3 EA $\frac{EL}{TH}$ R-2
2.		Determines descent attitude approach.	
3.			Relaxes elevator pressure & stops throttle adjustment
(D) 1.	STOPS PITCH DECREASE Visual ADI- Pitch: descent Bank: level VV - constant rate descent Alt- descent Remainder Constant Aural-Normal envir. sound Control-Decreased elevator pressure Motion-Decreasing negative G, pitch stabilized		Fi-9 (D) 27 1 V CM 3C T-10 2 L-2 MC SJ 3 EA $\frac{TR}{EL}$ R-2
2.		Determines trim required	
3.			Adjusts trim & relaxes elevator pressure

SITUATION Aircraft climbing at constant airspeed on constant heading

TASK NO. Fi-9 TASK Straight ahead climb/transition to straight ahead descent at constant airspeed

TASK GOAL To establish straight ahead descent DATE July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(E)	ESTABLISHES STEADY-STATE		Fi-9 (E) 0 1 V I-C T-8 2 L-1 MC SJ 3 EA — —
1.	Visual ADI- Pitch: descent Bank: level VV - constant rate descent Alt- descent Remainder Constant Aural-Normal envir. sound Control-Neutral pressure Motion-Normal G		
2.		Determines goal is established	
3.			Maintains descent control

SITUATION Aircraft descending straight ahead at cruise speed

TASK NO. Fi-10 **TASK** Straight ahead descent/ transition to straight & level flight

TASK GOAL To establish straight & level flight **DATE** July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(A) 1.	BEGINS LEVEL OFF Visual ADI- Pitch: descent Bank: level Tach- constant HSI- constant T/S- str. & wings level A/S- constant VV - constant rate descent Alt- descent Aural-Normal envir. sound Control-Neutral pressure Motion-Normal G		Fi 10 (A) 58 1 V I-C T-8 2 LS RP SJ 3 ER EL MS R-S
2.		Anticipates transition to level off	
3.			Coordinates elevator & throttle adjust.
(B) 1.	STARTS PITCH INCREASE Visual ADI- Pitch: increasing Bank: level Tach- increasing rpm VV - descent rate decr. Alt- descent Remainder Constant Aural-Change in envir. sound Control-Increased elevator pressure & throttle increase Motion-Positive G onset, pitching up		Fi-10 (B) 42 1 VA GM AC T12 2 L2 MC SJ 3 ER EL M R2
2.		Determines satisfactory pitch attitude movement	
3.			Maintains constant elevator pressure & continues throttle adjustment

SITUATION Aircraft descending straight ahead at cruise speed

TASK NO. Fi-10 **TASK** Straight ahead descent/ transition to straight & level flight

TASK GOAL To establish straight & level flight **DATE** July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(C)	CONTINUES PITCH INCREASE		Fi-10 (C) R2 1 VA CM 4-C T-12 2 L-2 MC SJ 3 EA EL/TH R2
1.	Visual ADI- Pitch: increasing Bank: level Tach- increasing rpm VV - descent rate decr. Alt- descent Remainder Constant Aural-Change in envir. sound Control-Constant elevator pressure & throttle increase Motion-Constant positive G, pitching up		
2.		Determines cruise attitude approach.	
3.			Relaxes elevator pressure & stops throttle adjust.
(D)	STOPS PITCH INCREASE		Fi-10 (D) R2 1 V CM 3-C F-10 2 L-2 MC SJ 3 EA EL/TR R2
1.	Visual ADI- Pitch: cruise Bank: level Tach- cruise power VV - level Alt- level Remainder Constant Aural-Normal envir. sound Control-Decreased elevator pressure Motion-Decreasing positive G, pitch stabilized		
2.		Determines trim required	
3.			Adjusts trim & relaxes elevator pressure

SITUATION Aircraft descending straight ahead at cruise speed

TASK NO. Fi-10 TASK Straight ahead descent/ transition to straight & level flight

TASK GOAL To establish straight & level flight DATE July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(E) 1.	ESTABLISHES STEADY-STATE Visual ADI- Pitch: cruise Bank: level VV - level Alt- level Remainder Constant Aural-Normal envir.sound Control-Neutral pressure Motion-Normal G		Fi-10 (E) 0 1 V. i-C T-8 2 L-1 MC SJ 3 EA — —
2.		Determines goal is established	
3.			Maintains cruise control

SITUATION Aircraft descending straight ahead at cruise speed

TASK NO. Fi-11 **TASK** Straight ahead descent/transition to descending turn (30° bank)

TASK GOAL To establish descending turn **DATE** July, 1974

NOTE: A/S decrease in 30° bank negligible & not perceptible (NP)

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(A) 1.	BEGINS TURN Visual ADI- Pitch: descent Bank: level Tach- constant HSI- constant T/S- str. & wings level A/S- constant VV - constant rate descent Alt- descent Aural-Normal envir. sound Control-Neutral pressure Motion-Normal G		Fi-11(A) 60 1 V 1-C 1-8 2 L-4 RF SJ 3 ER AL RU EL R-5
2.		Anticipates transition to 30° bank turn	
3.			Coordinates aileron & rudder, increases elevator pressure
(B) 1.	STARTS ROLL Visual ADI- Pitch: descent Bank: rolling HSI- turn initiated T/S- coordinated turn initiated VV - descent rate increasing NP Remainder Constant Aural-Normal envir. sound Control-Increased aileron, rudder & elevator pressure Motion-Positive G onset		Fi-11(B) 150 1 V CM 3-C T-11 2 L-4 MC CJ 3 ER AL RU EL R-5
2.		Determines satisfactory roll rate	
3.			Maintains coordinated aileron & rudder pressure, increases elevator pressure

SITUATION Aircraft descending straight ahead at cruise speed

TASK NO. Fi-11 TASK Straight ahead descent/transition to descending turn (30° bank)

TASK GOAL To establish descending turn DATE July, 1974

NOTE: A/S decrease in 30° bank negligible & not perceptible (NP)

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(C) 1.	CONTINUES ROLL Visual ADI- Pitch: descent Bank: rolling HSI- turn T/S- coordinated turn rate increasing VV - descent rate increasing NP Remainder Constant Aural-Normal envir. sound Control-Constant aileron & rudder pressure, increased elevator pressure Motion-Increasing positive G		Fi-11(C) 27 1 V CM 3-C T-11 2 L-2 MC SJ 3 EA AL CO. EL R-2
2.		Determines proper bank attitude approaching	
3.			Moves aileron, relaxes rudder pres. & maintains elevator pressure
(D) 1.	STOPS ROLL Visual ADI- Pitch: descent Bank: 30° HSI- turn T/S- coordinated turn rate stabilized VV - constant rate descent Remainder Constant Aural-Normal envir. sound Control-Neutral aileron & rudder pressure, constant elevator pressure Motion-Constant positive G		Fi-11(D) 27 1 V CM 3-C T-9 2 L-2 MC SJ 3 EA TR EL R-2
2.		Determines trim required	

SITUATION Aircraft descending straight ahead at cruise speed

TASK NO. Fi-11 **TASK** Straight ahead descent/transition to descending turn (30° bank)

TASK GOAL To establish descending turn **DATE** July, 1974

NOTE: A/S decrease in 30° bank negligible & not perceptible (NP)

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(D) 3.	STOPS ROLL		Adjusts trim & relaxes elevator pressure
(E) 1.	ESTABLISHES STEADY-STATE Visual ADI- Pitch: descent Bank: constant 30° HSI- turn T/S- coordinated turn Remainder Constant Aural-Normal envir. sound Control-Neutral pressure Motion-Constant positive G		
2.		Determines goal is established	
3.			Maintains turn control

Fi-11(E) o

1	V M	2-C	F-8
2	L-2	MC	SJ
3	EA	—	—

SITUATION Aircraft descending straight ahead at cruise speed

TASK NO. Fi-12 **TASK** Straight ahead descent/ transition to straight ahead climb

TASK GOAL To establish a straight ahead climb from a descent **DATE** July, 1974

NOTE: Climb speed lower than cruise speed

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(A)	BEGINS CLIMB		
1.	Visual ADI- Pitch: descent Bank: level Tach- constant HSI- constant T/S- str. & wings level A/S- constant VV - constant rate descent Alt- descent Aural-Normal envir. sound Control-Neutral pressure Motion-Normal G		Fi-12(A) .56 1 V 1-C T-8 2 L-2 RP SJ 3 ER EL R-1
2.		Anticipates transition to climb	
3.			Moves elevator
(B)	STARTS PITCH INCREASE		
1.	Visual ADI- Pitch: increasing Bank: level A/S- decreasing VV - descent rate decreasing Alt- descent Remainder Constant Aural-Normal envir. sound Control-Increased elevator pressure Motion-Positive G onset, pitching up		Fi-12(B) .46. 1 V CM 3-C T-10 2 L-2 MC CJ 3 ER EL R-1
2.		Determines satisfactory pitch attitude movement	
3.			Maintains constant elevator pressure

SITUATION Aircraft descending straight ahead at cruise speed

TASK NO. Fi-12 **TASK** Straight ahead descent/ transition to straight ahead climb

TASK GOAL To establish a straight ahead climb from a descent **DATE** July, 1974

NOTE: Climb speed lower than cruise speed

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(C) 1.	CONTINUES PITCH INCREASE Visual ADI- Pitch: increasing Bank: level A/S- decreasing VV - climb rate initiated Alt- climb Remainder Constant Aural-Normal envir. sound Control-Constant elevator pressure Motion-Constant positive G, pitching up		Fi-12 (0) 26 1 ✓ CM 3-C T-10 2 L-2 MC SJ 3 EA EL R-1
2.		Determines climb attitude approach.	
3.			Relaxes elevator pressure
(D) 1.	STOPS PITCH INCREASE Visual ADI- Pitch: climb Bank: level A/S- decreasing VV - climb Alt- climb Remainder Constant Aural-Normal envir. sound Control-Decreased elevator pressure Motion-Decreasing positive G, pitch stabilized		Fi-12(0) 163 1 ✓ CM 3C T-10 2 L:2 SC SJ 3 EA TH R-1
2.		Observes climb speed approaching	
3.			Adjusts throttle

SITUATION Aircraft descending straight ahead at cruise speed

TASK NO. Fi-12 **TASK** Straight ahead descent/ transition to straight ahead climb

TASK GOAL To establish a straight ahead climb from a descent **DATE** July, 1974

NOTE: Climb speed lower than cruise speed

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(E) 1.	ADJUSTS POWER Visual ADI- Pitch: climb Bank: level Tach- climb power VV - constant rate climb Alt- climb Remainder Constant Aural-Change in envir. sound Control-Constant elevator pressure & throttle increase Motion-Normal G		Fi-12 (E) 27 1 V AC 3C T-10 2 L-2 MC SJ 3 EA TR/EL R2
2.		Determines trim required	
3.			Adjusts trim & relaxes elevator pressure
(F) 1.	ESTABLISHES STEADY-STATE Visual ADI- Pitch: climb Bank: level VV - constant rate climb Alt- climb Remainder Constant Aural-Normal envir. sound Control-Neutral pressure Motion-Normal G		Fi-12(F) 0. 1 V 1-C T-8 2 L-1 MC SJ 3 EA — -
2.		Determines goal is established	
3.			Maintains climb control

SITUATION Aircraft straight and level at low cruise speed

TASK NO. Fi-13 TASK Low cruise/transition to normal cruise

TASK GOAL To establish normal cruise DATE July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(A) 1.	BEGINS NORMAL CRUISE Visual ADI- Pitch: nose high Bank: level Tach- constant HSI- constant T/S- str. & wings level A/S- constant VV - level Alt- constant Aural-Normal envir. sound Control-Neutral pressure Motion-Normal G		Fi-13 (A) 57 1 V 1-C F-8 2 L-2 RP SJ 3 ER TH/EL R-2
2.		Anticipates transition to normal cruise	
3.			Adjusts throttle & increases elevator pressure
(B) 1.	STARTS ACCELERATION Visual ADI- Pitch: decreasing Bank: level Tach- increasing rpm A/S- increasing Remainder Constant Aural-Change in envir. sound Control-Increased elevator pressure & throttle increase Motion-Normal G,acceleration		Fi-13 (B) 141. 1 V A CM 4-C F-11 2 L-2 MC CJ 3 ER EL R-1
2.		Determines satisfactory power setting & pitch decr.	
3.			Increases elevator pressure

SITUATION Aircraft straight and level at low cruise speed

TASK NO. Fi-13 TASK Low cruise/transition to normal cruise

TA[illegible] GOAL To establish normal cruise DATE July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(C) 1.	CONTINUES ACCELERATION Visual ADI- Pitch: decreasing Bank: level A/S- increasing Remainder Constant Aural-Normal envir. sound Control-Increased elevator pressure Motion-Normal G,acceleration		Fi-13 (C) 27 1 V CM 3C T-9 2 L-2 MC SJ 3 EA TH/EL R-2
2.		Determines proper speed approaching	
3.			Adjusts throttle & maintains elevator pressure
(D) 1.	STOPS ACCELERATION Visual ADI- Pitch: cruise Bank: level Tach- decreasing rpm Remainder Constant Aural-Change in envir. sound Control-Constant stick pressure & throttle reduction Motion-Normal G		Fi-13 (D) 27 1 V A C 3C T-10 2 L-2 MC SJ 3 EA TR/EL R-2
2.		Determines speed correct & trim required	
3.			Adjusts trim & relaxes elevator pressure

SITUATION Aircraft straight and level at low cruise speed

TASK NO. Fi-13 TASK Low cruise/transition to normal cruise

TASK GOAL To establish normal cruise DATE July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(E) 1.	ESTABLISHES STEADY-STATE Visual ADI- Pitch: cruise Bank: level Remainder Constant Aural-Normal envir. sound Control-Neutral pressure Motion-Normal G		Fi-13(E) 0. 1 V 1-C T-8 2 L-1 MO SJ 3 EA — —
2.		Determines goal is established	
3.			Maintains cruise control

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. Fi-14 **TASK** Normal cruise/transition to low cruise

TASK GOAL To establish low cruise **DATE** July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(A)	BEGINS LOW CRUISE		
1.	Visual ADI- Pitch: cruise Bank: level Tach- constant HSI- constant T/S- str. & wings level A/S- constant VV - level Alt- constant Aural-Normal envir. sound Control-Neutral pressure Motion-Normal G		Fi-4(A) 57. 1 V 1-8 T-8 2 L-2 EP SJ 3 ER TH/EL E-2
2.		Anticipates transition to low cruise	
3.			Adjusts throttle & increases elevator pressure
(B)	STARTS DECELERATION		
1.	Visual ADI- Pitch: increasing Bank: level Tach- decreasing rpm A/S- decreasing Remainder Constant Aural-Change in envir. sound Control-Increased elevator pressure & throttle decrease Motion-Normal G, deceleration		Fi-4(B) 41. 1 V A CM 4-8 T-11 2 L-2 MC CJ 3 ER EL R-1
2.		Determines satisfactory power setting & pitch increase	
3.			Increases elevator pressure

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. Fi-14 **TASK** Normal cruise/transition to low cruise

TASK GOAL To establish low cruise **DATE** July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(C) 1.	CONTINUES DECELERATION Visual ADI- Pitch: increasing Bank: level A/S- decreasing Remainder Constant Aural-Normal envir. sound Control-Increased elevator pressure Motion-Normal G, deceleration		Fi-4(C) 27 1 V CM 5-C F9 2 L2 MC SJ 3 EA TH/EA R2
2.		Determines proper speed approaching	
3.			Adjusts throttle & maintains elevator pressure
(D) 1.	STOPS DECELERATION Visual ADI Pitch: nose high Bank: level Tach- increasing rpm Remainder Constant Aural-Change in envir. sound Control-Constant stick pres. & throttle increase Motion-Normal G		Fi 14(D) 27 1 V AC 5-C F10 2 L2 MC SJ 3 EA TR/EL R2
2.		Determines speed correct & trim required	
3.			Adjusts trim & relaxes elevator pressure

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. Fi-14 **TASK** Normal cruise/transition to low cruise

TASK GOAL To establish low cruise **DATE** July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(E) 1.	ESTABLISHES STEADY-STATE Visual ADI- Pitch: nose high Bank: level Remainder Constant Aural-Normal envir. sound Control-Neutral pressure Motion-Normal G		FI-14(E) O 1 V 1-2 T-P 2 L-1 MR SJ 3 EA — —
2.		Determines goal is established	
3.			Maintains low cruise control

SITUATION Aircraft in normal cruise configuration and speed, maintaining heading and altitude

TASK NO. Cpi-1 **TASK** Vertical SD

TASK GOAL To perform a vertical SD **DATE** July, 1974

NOTE: Constant speed held throughout

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(A)	BEGINS VERTICAL SD		Cpi-1(A) 69 1 V 1-C T-8 2 L-3 RP SJ 3 ER AL/RU } EL/TH } R-3
1.	Visual ADI- Pitch: cruise Bank: level Tach- constant rpm HSI- constant T/S- str. & wings level A/S- constant VV - level Alt- constant Aural-Normal envir. sound Control-Neutral pressure Motion-Normal G		
2.		Anticipates transition to descending turn	
3.			Coordinates aileron & rudder pres, coordinates elevator & throttle adjust.
(B)	STARTS TRANSITION TO DESCENDING TURN		Cpi-1(B) 143 1 V A C M 4-C T-13 2 L-3 MC CJ 3 ER AL } EL/TH } R-3
1.	Visual ADI- Pitch: decreasing Bank: rolling Tach- decreasing rpm HSI- turn initiated T/S- coordinated turn A/S- constant VV - descent rate initiated Alt- descent initiated Aural-Change in envir. sound Control-Increased aileron, rudder & elevator pres; & throttle dec. Motion-Normal G, pitching down		
2.		Determines pitch attitude movement, roll rate, & power decrease satisf.	

SITUATION Aircraft in normal cruise configuration and speed, maintaining heading and altitude

TASK NO. Cpi-1 TASK Vertical SD

TASK GOAL To perform a vertical SD DATE July, 1974

NOTE: Constant speed held throughout

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(B)	STARTS TRANSITION TO DESCENDING TURN		
3.			Maintains coordinated aileron & rudder pres, coordinates elevator & throttle adjust.
(C)	CONTINUES TRANSITION TO DESCENDING TURN		Cpi-1(C) 102 1 VA CM 4-C T-13 2 L-2 MC CJ 3 EA AI RU EL R-2
1.	Visual ADI- Pitch: decreasing Bank: rolling Tach- decreasing HSI- turn T/S- coordinated turn A/S- constant VV - descent rate incr. Alt- descent Aural-Change in envir. sound Control-Constant aileron & rudder pressure, incr. elevator pressure, & throttle decrease Motion-Normal G, pitching down		
2.		Determines proper pitch & bank att., power setting approaching	
3.			Moves aileron, relaxes rudder pres., relaxes elevator pres., & stops throttle adj.
(D)	STOPS ROLL INCREASE AND PITCH DECREASE		Cpi-1(D) 163 1 V C 2-C T-10 2 L-2 SC SJ 3 EA EL R-1
1.	Visual ADI- Pitch: nose low Bank: constant Tach- constant rpm HSI- turn T/S- coordinated desired rate turn A/S- constant VV - desired rate descent Alt- descent		

SITUATION Aircraft in normal cruise configuration and speed, maintaining heading and altitude

TASK NO. Cpi-1 TASK Vertical SD

TASK GOAL To perform a vertical SD DATE July, 1974

NOTE: Constant speed held throughout

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(D) 1.	STOPS ROLL INCREASE AND PITCH DECREASE Aural-Normal envir. sound Control-Increased aileron pres, decreased rudder & elevator pres. Motion-Normal G, pitch stabilized		
2.		Observes proper turn & descent rate	
3.			Maintains elevator pressure
(E) 1.	CONTINUES DESCENDING TURN Visual ADI- Pitch: nose low Bank: constant Tach- constant rpm HSI- turn T/S- coordinated desired turn rate A/S- constant VV - desired rate descent Alt- descent Aural-Normal envir. sound Control-Constant elevator pressure Motion-Normal G		
2.		Determines proper heading & altitude approaching	
3.			Coordinates aileron & rudder pressure, coordinates elevator & throttle adjustment
(F) 1.	STARTS TRANSITION TO CLIMBING TURN Visual ADI- Pitch: increasing Bank: rolling Tach- increasing rpm HSI- turn		

Cpi-1 (E) 69

1	V C	2-C	T-9
2	L-3	MC	SJ
3	ER	AL RU EL TH	R-3

SITUATION Aircraft in normal cruise configuration and speed, maintaining heading and altitude

TASK NO. Cpi-1 **TASK** Vertical SD

TASK GOAL To perform a vertical SD **DATE** July, 1974

NOTE: Constant speed held throughout

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(F)	STARTS TRANSITION TO CLIMBING TURN		Cpi-1(F) 143 1 VA CM · 4-C · T-13 2 L-3 · MC · CJ 3 ER · AI RU EL TH · R-3
1.	Visual T/S- coordinated turn rate decreasing A/S- constant VV - rate descent decreasing Alt- descent Aural-Change in envir. sound Control-Increased aileron, rudder & elevator pres; throttle incr. Motion-Normal G, pitching up		
2.		Anticipates transition to climbing turn & observes proper heading & altitude	
3.			Maintains coordinated aileron & rudder pres, coordinates elevator & throttle adjustment
(G)	CONTINUES TRANSITION TO CLIMBING TURN		Cpi-1(G) 143 1 VA CM · 4-C · T-14 2 L-3 · MC · CJ 3 ER · AI RU EL TH · R-3
1.	Visual ADI- Pitch: increasing Bank: rolling Tach- increasing rpm HSI- turn reversal T/S- coordinated turn A/S- constant VV - climb rate initiated Alt- climb initiated Aural-Change in envir. sound Control-Constant aileron & rudder pres, incr. elevator pres., & throttle increase Motion-Positive G onset, pitching up		

SITUATION Aircraft in normal cruise configuration and speed, maintaining heading and altitude

TASK NO. Cpi-1 **TASK** Vertical SD

TASK GOAL To perform a vertical SD **DATE** July, 1974

NOTE: Constant speed held throughout

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(G)	CONTINUES TRANSITION TO CLIMBING TURN		
2.		Determines pitch attitude movement, roll rate, & power increase satisf.	
3.			Maintains coordinated aileron & rudder pressure, coordinates elevator & throttle adjustment
(H)	CONTINUES TRANSITION TO CLIMBING TURN		
1.	Visual ADI- Pitch: increasing Bank: rolling Tach- increasing rpm HSI- turn T/S- coordinated turn A/S- constant VV - climb rate increasing Alt- climb Aural-Change in envir. sound Control-Constant aileron & rudder pressure, increased elevator pressure, & throttle increase Motion-Positive G, pitching up		
2.		Determines proper pitch & bank att., & power setting approaching	
3.			Moves aileron, relaxes rudder pres., relaxes elevator pres., & stops throttle adjust.

Cpi-1 (H) 142.

1	VA CM	A-C	T-14
2	L-2	MC	CJ
3	ER	AI RU EL TH	R-2

SITUATION Aircraft in normal cruise configuration and speed, maintaining heading and altitude

TASK NO. Cpi-1 **TASK** Vertical SD

TASK GOAL To perform a vertical SD **DATE** July, 1974

NOTE: Constant speed held throughout

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(I) 1.	STOPS PITCH AND ROLL INCREASE Visual ADI- Pitch: nose high Bank: constant Tach- constant rpm HSI- turn T/S- coordinated desired turn rate A/S- constant VV - desired rate climb Alt- climb Aural-Normal envir. sound Control-Increased aileron pressure, decreased rudder & elevator pressure Motion-Constant positive G, pitch stabilized		Cpi-1(I) 163 1 V CM · 3-C · T-11 2 L-2 · SC · SJ 3 EA · EL · R-1
2.		Observes proper turn & climb rate	
3.			Maintains elevator pressure
(J) 1.	CONTINUES CLIMBING TURN Visual ADI- Pitch: nose high Bank: constant Tach- constant rpm HSI- turn T/S- coordinated desired turn rate A/S- constant VV - desired rate climb Alt- climb Aural-Normal envir. sound Control-Constant elevator pressure Motion-Constant positive G		Cpi-1(J) 28 1 V CM · 3-C · T-9 2 L-3 · MC · SJ 3 EA · AL RU / EL TN · R-3

SITUATION Aircraft in normal cruise configuration and speed, maintaining heading and altitude

TASK NO. Cpi-1 TASK Vertical SD

TASK GOAL To perform a vertical SD DATE July, 1974

NOTE: Constant speed held throughout

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(J)	CONTINUOUS CLIMBING TURN		
2.		Determines proper heading & altitude approaching	
3.			Coordinates aileron & rudder pressure, coordinates elevator and throttle adjustment
(K)	STARTS TRANSITION TO DESCENDING TURN		
	Repeat from (B)		

SITUATION Aircraft flying str. & level, following vectors at glide slope intercept altitude, flaps as needed, landing gear retracted, radios tuned, intercepting localizer from left.

TASK NO. Cpi-2 **TASK** Fly ILS with raw nav. display

TASK GOAL To fly aircraft to decision height (DH) **DATE** July, 1974

NOTE: A/S decrease in bank negligible & not perceptible (NP)

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(A)	BEGINS ILS		
1.	Visual ADI-Pitch: nose high Bank: level Tach- constant rpm HSI- constant T/S- str. & wings level A/S- constant VV - level Alt- constant CDI- fly right GSI- fly up Aural-Normal envir. sound Control-Neutral pressure Motion-Normal G		Cpi-2 (A) 17. 1 V | 1-C | [illegible] (SJ) T-7 2 L-2 | RP | SJ 3 EA | AI RU EL | L-2
2.		Anticipates turn to intermediate approach	
3.			Maintains aileron, rudder & elevator control
(B)	CONTINUES LOW CRUISE		
1.	Visual ADI- Pitch: nose high Bank: level Tach- constant rpm HSI- constant T/S- str. & wings level A/S- constant VV - level Alt- constant CDI- fly right GSI- fly up Aural-Voice transmission Control-Neutral pressure Motion-Normal G		Cpi-2(B) 75. 1 VA | 2-C | T-8 2 L-4 | MC | SJ 3 ER | AI RU EL | R-5
2.		Determines heading change required	

SITUATION Aircraft flying str. & level, following vectors at glide slope intercept altitude, flaps as needed, landing gear retracted, radios tuned, intercepting localizer from left.

TASK NO. Cpi-2 TASK Fly ILS with raw nav. display

TASK GOAL To fly aircraft to decision height (DH) DATE July, 1974

NOTE: A/S decrease in bank negligible & not perceptible (NP)

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(B) 3.	CONTINUES LOW CRUISE		Coordinates aileron & rudder, increases elevator pressure
(C) 1.	STARTS ROLL Visual ADI- Pitch: increasing Bank: rolling Tach- constant rpm HSI- turn initiated T/S- coordinated turn initiated A/S- decreasing NP VV - level Alt- constant CDI- fly right GSI- fly up Aural-Normal envir. sound Control-Increased aileron, rudder & elevator pressure Motion-Positive G onset		CPi-2(C) 150 1 V 0M 3-C T-12 2 L-4 MC CJ 3 ER AI RU / EL R-5
2.		Determines roll rate & pitch attitude satisfactory	
3.			Maintains coordinated aileron & rudder pressure, increases elevator pressure
(D) 1.	CONTINUES ROLL Visual ADI- Pitch: increasing Bank: rolling Tach- constant rpm HSI- turn T/S- coordinated turn rate increasing A/S- decreasing NP VV - level Alt- constant		

SITUATION Aircraft flying str. & level, following vectors at glide slope intercept altitude, flaps as needed, landing gear retracted, radios tuned, intercepting localizer from left.

TASK NO. Cpi-2 **TASK** Fly ILS with raw nav. display

TASK GOAL To fly aircraft to decision height (DH) **DATE** July, 1974

NOTE: A/S decrease in bank negligible & not perceptible (NP)

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(D) 1.	CONTINUES ROLL Visual CDI- fly right GSI- fly up Aural-Normal envir. sound Control-Constant aileron & rudder pressure, increased elevator pressure Motion-Increasing positive G		Cpi-2 (D) 27 1 V CM 3-C T-12 2 L-2 MC SJ 3 EA AI RU EL R-2
2.		Determines desired bank approaching	
3.			Moves aileron, releases rudder pres, & maintains elevator pressure
(E) 1.	STOPS ROLL Visual ADI- Pitch: constant Bank: constant Tach- constant rpm HSI- turn T/S- coordinated constant rate turn A/S- constant VV - level Alt- constant CDI- fly right GSI- fly up Aural-Normal envir. sound Control-Increased aileron pres., decreased rudder pres., & constant elevator pressure Motion-Constant positive G		Cpi-2 (E) 106 1 V CM 3-C T-12 2 L-2 MC CJ 3 EA EL R-1
2.		Determines bank angle & pitch att. satisfactory	

SITUATION Aircraft flying str. & level, following vectors at glide slope intercept altitude, flaps as needed, landing gear retracted, radios tuned, intercepting localizer from left.

TASK NO. Cpi-2 **TASK** Fly ILS with raw nav. display

TASK GOAL To fly aircraft to decision height (DH) **DATE** July, 1974

NOTE: A/S decrease in bank negligible & not perceptible (NP)

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(E) 3.	STOPS ROLL		Maintains elevator pressure
(F) 1.	ANTICIPATES ROLL OUT ON CORRECT HEADING Visual ADI- Pitch: constant Bank: constant Tach- constant rpm HSI- correct heading approaching T/S- coordinated constant rate turn A/S- constant VV - level Alt- constant CDI- fly right GSI- fly up Aural-Normal envir. sound Control-Constant elevator pressure Motion-Constant positive G		Cpi-2(F) 70 1 V CM · 3-C · T-11 2 L-4 · MC · SJ 3 ER · AI RU / EL · R-5
2.		Determines correct heading approaching	
3.			Coordinates aileron & rudder pressure, decreases elevator pressure
(G) 1.	BEGINS ROLL OUT Visual ADI- Pitch: decreasing Bank: rolling Tach- constant rpm HSI- correct heading approaching T/S- coordinated decreasing turn rate A/S- increasing NP VV - level Alt- constant		

SITUATION Aircraft flying str. & level, following vectors at glide slope intercept altitude, flaps as needed, landing gear retracted, radios tuned, intercepting localizer from left.

TASK NO. Cpi-2 **TASK** Fly ILS with raw nav. display

TASK GOAL To fly aircraft to decision height (DH) **DATE** July, 1974

NOTE: A/S decrease in bank negligible & not perceptible (NP)

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(G) 1.	BEGINS ROLL OUT Visual CDI- fly right GSI- fly up Aural-Normal envir. sound Control-Increased aileron & rudder pressure, decreased elevator pressure Motion-Decreasing positive G		Cpi-2 (G) 150 1 ✓CM 3-C T-12 2 L-4 MC CJ 3 ER AI RU 5 EL R-5
2.		Determines roll rate & pitch attitude satisfactory	
3.			Maintains coordinated aileron & rudder pressure, decreases elevator pressure
(H) 1.	CONTINUES ROLL OUT Visual ADI- Pitch: decreasing Bank: rolling Tach- constant rpm HSI- correct heading approaching T/S- coordinated decreasing turn rate A/S- increasing NP VV - level Alt- constant CDI- fly right GSI- fly up Aural-Normal envir. sound Control-Constant aileron & rudder pressure, decreased elevator pressure Motion-Decreasing positive G		Cpi-2 (H) 27. 1 ✓CM 3-C T-12 2 L-2 MC SJ 3 EA AI RU EL R-2

SITUATION Aircraft flying str. & level, following vectors at glide slope intercept altitude, flaps as needed, landing gear retracted, radios tuned, intercepting localizer from left.

TASK NO. Cpi-2 **TASK** Fly ILS with raw nav. display

TASK GOAL To fly aircraft to decision height (DH) **DATE** July, 1974

NOTE: A/S decrease in bank negligible & not perceptible (NP)

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(H)	CONTINUES ROLL OUT		
2.		Determines wings level attitude approaching	
3.			Moves aileron, relaxes rudder pressure, & decreases elevator pressure
(I)	STOPS ROLL OUT		Cpi-2(I) 0 1 ✓C 2-C T-10 2 L-1 RP ST 3 EA — —
1.	Visual ADI- Pitch: nose high Bank: level Tach- constant HSI- correct heading T/S- str. & wings level A/S- constant VV - level Alt- constant CDI- fly right GSI- fly up Aural-Normal envir. sound Control-Decreased aileron, rudder & elevator pressure Motion-Normal G		
2.		Anticipates localizer intercept	
3.			Maintains low cruise control
(J)	BEGINS LOCALIZER INTERCEPT		
1.	Visual ADI- Pitch: nose high Bank: level Tach- constant rpm HSI- constant T/S- str. & wings level A/S- constant VV - level Alt- constant		

SITUATION Aircraft flying str. & level, following vectors at glide slope intercept altitude, flaps as needed, landing gear retracted, radios tuned, intercepting localizer from left.

TASK NO. Cpi-2 TASK Fly ILS with raw nav. display

TASK GOAL To fly aircraft to decision height (DH) DATE July, 1974

NOTE: A/S decrease in bank negligible & not perceptible (NP)

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(J) 1.	BEGINS LOCALIZER INTERCEPT Visual CDI- moving toward center GSI- fly up Aural-Normal envir. sound Control-Neutral pressure Motion-Normal G		Cpi-2 (J) 150. 1 V 1-C T-10 2 L-4 MC CJ 3 ER AI RU EL R-5
2.		Determines proper lead point approaching	
3.			Coordinates aileron & rudder, increases elevator pressure
(K) 1.	STARTS ROLL Visual ADI- Pitch: increasing Bank: rolling Tach- constant rpm HSI- turn initiated T/S- coordinated turn initiated A/S- decreasing NP VV - level Alt- constant CDI- moving toward center GSI- fly up Aural-Normal envir. sound Control-Increased aileron, rudder & elevator pressure Motion-Positive G onset		Cpi-2 (K) 150 1 V CM 3-C T-14 2 L-4 MC CJ 3 ER AI RU EL R-5
2.		Determines roll rate & pitch attitude satisf.	
3.			Maintains coordinated aileron & rudder pressure, increases elevator pressure

SITUATION Aircraft flying str. & level, following vectors at glide slope intercept altitude, flaps as needed, landing gear retracted, radios tuned, intercepting localizer from left.

TASK NO. Cpi-2 TASK Fly ILS with raw nav. display

TASK GOAL To fly aircraft to decision height (DH) DATE July, 1974

NOTE: A/S decrease in bank negligible & not perceptible (NP)

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(L) 1.	CONTINUES ROLL Visual ADI- Pitch: increasing Bank: rolling Tach- constant rpm HSI- turn T/S- coordinated turn rate increasing A/S- decreasing NP VV - level Alt- constant CDI- moving toward center GSI- fly up Aural-Normal envir. sound Control-Constant aileron & rudder pressure, increased elevator pressure Motion-Increasing positive G		Cpi-2(L) 27. 1 V CM | 3-C | T-14 2 L-2 | MC | SJ 3 EA | AI 2U EL | R-2
2.		Determines desired bank approaching	
3.			Moves aileron, releases rudder pres, & maintains elevator pressure
(L) 1.	STOPS ROLL Visual ADI- Pitch: constant Bank: constant Tach- constant rpm HSI- turn T/S- coordinated constant rate turn A/S- constant VV - level Alt- constant CDI- moving toward center GSI- fly up Aural-Normal envir. sound		Cpi-2(M) 106 1 V CM | 3-C | T-14 2 L-2 | MC | CJ 3 EA | EL | R-1

SITUATION Aircraft flying str. & level, following vectors at glide slope intercept altitude, flaps as needed, landing gear retracted, radios tuned, intercepting localizer from left.

TASK NO. Cpi-2 **TASK** Fly ILS with raw nav. display

TASK GOAL To fly aircraft to decision height (DH) **DATE** July, 1974

NOTE: A/S decrease in bank negligible & not perceptible (NP)

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(M)	STOPS ROLL		
1.	Control-Increased aileron pres., decreased rudder pres., & constant elevator pressure Motion-Constant positive G		
2.		Determines bank angle & pitch att. satisfactory	
3.			Maintains elevator pressure
(N)	ANTICIPATES ROLL OUT ON CORRECT HEADING		
1.	Visual ADI- Pitch: constant Bank: constant Tach- constant rpm HSI- correct heading approaching T/S- coordinated constant rate turn A/S- constant VV - level Alt- constant CDI - moving toward center GSI- fly up Aural-Normal envir. sound Control-Constant elevator pressure Motion-Constant positive G		
2.		Determines correct heading approaching	
3.			Coordinates aileron & rudder pressure, decreases elevator pressure

Cpi-2 (N) /50

1	V CM	5-C	T-12
2	L-4	MC	CJ
3	ER	AI AS EL	R-5

SITUATION Aircraft flying str. & level, following vectors at glide slope intercept altitude, flaps as needed, landing gear retracted, radios tuned, intercepting localizer from left.

TASK NO. Cpi-2 **TASK** Fly ILS with raw nav. display

TASK GOAL To fly aircraft to decision height (DH) **DATE** July, 1974

NOTE: A/S decrease in bank negligible & not perceptible (NP)

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(O)	BEGINS ROLL OUT		Cpi-2 (0) 150 1 V CM · 3-C · T-14 2 L-4 · MC · CJ 3 ER · AL/RU S/EL · R-5
1.	Visual ADI- Pitch: decreasing Bank: rolling Tach- constant rpm HSI- correct heading approaching T/S- coordinated decreasing turn rate A/S- increasing NP VV - level Alt- constant CDI- moving toward center GSI- fly up Aural-Normal envir. sound Control-Increased aileron & rudder pressure, decreased elevator pressure Motion-Decreasing positive G		
2.		Determines roll rate & pitch attitude satisfactory	
3.			Maintains coordinated aileron & rudder pressure, decreases elevator pressure
(P)	CONTINUES ROLL OUT		
1.	Visual ADI- Pitch: decreasing Bank: rolling Tach- constant rpm HSI- correct heading approaching T/S- coordinated decreasing turn rate A/S- increasing NP VV - level Alt- constant		

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SITUATION Aircraft flying str. & level, following vectors at glide slope intercept altitude, flaps as needed, landing gear retracted, radios tuned, intercepting localizer from left.

TASK NO. Cpi-2 **TASK** Fly ILS with raw nav. display

TASK GOAL To fly aircraft to decision height (DH) **DATE** July, 1974

NOTE: A/S decrease in bank negligible & not perceptible (NP)

<table>
<tr><th>EL. SEQ.</th><th>CUES</th><th>MENTAL ACTION</th><th>MOTOR ACTION</th></tr>
<tr><td>(P)
1.</td><td>CONTINUES ROLL OUT
Visual
CDI- moving toward center
GSI- fly up
Aural-Normal envir. sound
Control-Constant aileron & rudder pressure, decreased elevator pressure
Motion-Decreasing positive G</td><td></td><td>Cpi-2(P) 27<table><tr><td>1</td><td>V
CM</td><td>3-C</td><td>T-14</td></tr><tr><td>2</td><td>L-2</td><td>MC</td><td>SJ</td></tr><tr><td>3</td><td>EA</td><td>AI
RU
EL</td><td>R-2</td></tr></table></td></tr>
<tr><td>2.</td><td></td><td>Determines wings level attitude approaching</td><td></td></tr>
<tr><td>3.</td><td></td><td></td><td>Moves aileron, relaxes rudder pressure, & decreases elevator pressure</td></tr>
<tr><td>(Q)
1.</td><td>STOPS ROLL OUT
Visual
ADI- Pitch: nose high
Bank: level
Tach- constant
HSI- correct heading
T/S- str, & wings level
A/S- constant
VV - level
Alt- constant

CDI- on course
GSI- fly up
Aural-Normal envir. sound
Control-Decreased aileron, rudder & elevator pressure
Motion-Normal G</td><td></td><td>Cpi-2 (Q) 0.<table><tr><td>1</td><td>V
C</td><td>2-C</td><td>T-13</td></tr><tr><td>2</td><td>L-1</td><td>MC</td><td>SJ</td></tr><tr><td>3</td><td>EA</td><td>—</td><td>—</td></tr></table></td></tr>
<tr><td>2.</td><td></td><td>Determines localizer intercept & glide slope intercept is next</td><td></td></tr>
</table>

SITUATION Aircraft flying str. & level, following vectors at glide slope intercept altitude, flaps as needed, landing gear retracted, radios tuned, intercepting localizer from left.

TASK NO Cpi-2 **TASK** Fly ILS with raw nav. display

TASK GOAL To fly aircraft to decision height (DH) **DATE** July, 1974

NOTE: A/S decrease in bank negligible & not perceptible (NP)

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(Q) 3.	STOPS ROLL OUT		Maintains low cruise control
(R) 1.	BEGINS GLIDE SLOPE INTERCEPT Visual ADI- Pitch: nose high Bank: level Tach- constant rpm HSI- constant T/S- str. & wings level A/S- constant VV - level Alt- constant CDI- on course GSI- moving toward center Aural-Outer marker (OM) code Control-Neutral pressure Motion-Normal G		Cpi-2(R) 1/2 1 VA 2-C T-11 2 L-2 MC CJ 3 EA EL R-2
2.		Determines proper lead point approaching	
3.			Activates landing gear & flaps, moves elevator, adjusts throttle
(S) 1.	STARTS DESCENT Visual ADI- Pitch: decreasing Bank: level Tach- increasing rpm HSI- constant T/S- str. & wings level A/S- constant VV - descent rate initiated Alt- descent CDI- on course GSI- on glide path Aural-OM code		

SITUATION Aircraft flying str. & level, following vectors at glide slope intercept altitude, flaps as needed, landing gear retracted, radios tuned, intercepting localizer from left.

TASK NO. Cpi-2 **TASK** Fly ILS with raw nav. display

TASK GOAL To fly aircraft to decision height (DH) **DATE** July, 1974

NOTE: A/S decrease in bank negligible & not perceptible (NP)

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(S) 1.	STARTS DESCENT Control-Gear activation, increased elevator pressure, flap activation, & throttle increase Motion-Negative G onset, vibration		Cpi-2(S) 21. 1 VA CM 4-C T-16 2 L-1 MC CJ 3 EA EL R-1
2.		Determines pitch attitude movement satisfactory	
3.			Maintains constant elevator pressure
(T) 1.	CONTINUES DESCENT Visual ADI- Pitch: constant Bank: level Tach- constant rpm HSI- constant T/S- str. & wings level A/S- constant VV - rate descent established Alt- descent CDI- on course GSI- on glide path ADF- reversal OM Light- on Aural-OM code, voice transmission Control-Constant elevator pressure Motion-Normal G		Cpi-2 (T) 107. 1 VA C 3-C T-1A 2 L-2 MC SJ 3 EA TR/EL R-2
2.		Determines pitch & power satisfactory, trim required	
3.			Adjusts trim & relaxes elevator pressure

SITUATION Aircraft flying str. & level, following vectors at glide slope intercept altitude, flaps as needed, landing gear retracted, radios tuned, intercepting localizer from left.

TASK NO Cpi-2 TASK Fly ILS with raw nav. display

TASK GOAL To fly aircraft to decision height (DH) DATE July, 1974

NOTE: A/S decrease in bank negligible & not perceptible (NP)

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(U) 1.	ANTICIPATES DECISION HEIGHT Visual ADI- Pitch: constant Bank: level Tach- constant rpm HSI- constant T/S- str. & wings level A/S- constant VV - constant rate descent Alt- descent CDI- on course GSI- on glide path Aural-Middle Marker (MM) code Control-Neutral pressure Motion-Normal G		Cpi-2 (U) 0 1 VA 2-C T-11 2 L-1. MC SJ 3 EA — —
2.		Determines DH approaching	
3.			Maintains descent control
(V) 1.	ANTICIPATES MISSED APPROACH Visual ADI- Pitch: constant Bank: level Tach- constant rpm HSI- constant T/S- str. & wings level A/S- constant VV - constant rate descent Alt- DH CDI- on course GSI- on glide path MM light - on Aural-MM code Control-Neutral pressure Motion-Normal G		Cpi-2 (V) 22 1 VA 2-C T-11 2 L-2 MC SJ 3 ER EL TH R-2
2.		Determines no visual contact & missed approach must be executed	

SITUATION Aircraft flying str. & level, following vectors at glide slope intercept altitude, flaps as needed, landing gear retracted, radios tuned, intercepting localizer from left.

TASK NO. Cpi-2 **TASK** Fly ILS with raw nav. display

TASK GOAL To fly aircraft to decision height (DH) **DATE** July, 1974

NOTE: A/S decrease in bank negligible & not perceptible (NP)

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(V) 3.	ANTICIPATES MISSED APPROACH		Moves elevator & adjusts throttle
(W) 1.	STARTS PITCH INCREASE Visual ADI- Pitch: increasing Bank: level Tach- increasing rpm HSI- constant T/S- str. & wings level A/S- constant VV - rate descent decreasing Alt- climb initiated CDI- on course GSI- fly down Aural-Change in envir. sound Control-increased throttle & elevator pressure Motion-Positive G onset, pitching up		Cpi-2(W) 141 1 VA CM 4-C ~~[illegible]~~ F-13 [illegible] 2 L-2 MC CT 3 ER EL R-1
2.		Determines pitch attitude movement satisfactory	
3.			Maintains constant elevator pressure
(X) 1.	CONTINUES PITCH INCREASE Visual ADI- Pitch: increasing Bank: level Tach- increasing rpm HSI- constant T/S- str. & wings level A/S- constant VV - climb rate increasing Alt- climb Aural-Change in envir. sound Control-Constant elevator pressure Motion-Constant positive G, pitching up		Cpi-2 (X) 102 1 VA CM A-C F-12 2 L-2 MC CJ 3 EA EL 00 00 R-2

SITUATION Aircraft flying str. & level, following vectors at glide slope intercept altitude, flaps as needed, landing gear retracted, radios tuned, intercepting localizer from left.

TASK NO. Cpi-2 **TASK** Fly ILS with raw nav. display

TASK GOAL To fly aircraft to decision height (DH) **DATE** July, 1974

NOTE: A/S decrease in bank negligible & not perceptible (NP)

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(X)	CONTINUES PITCH INCREASE		
2.		Determines climb attitude approaching & need for flap & gear retraction	
3.			Moves elevator, activates gear & flaps
(Y) 1.	STOPS PITCH INCREASE Visual ADI- Pitch: climb Bank: level Tach- constant rpm HSI- constant T/S- str. & wings level A/S- increasing VV - climb rate increasing Alt- climb Aural-Change in envir. sound Control-Decreased elevator pressure, gear & flap activation Motion-Normal G, pitch stabilized, acceleration		Cpi-2 (Y) 102 1 VA CM 4-C T-13 L-2 MC CJ EA [illegible] R-2
2.		Determines pitch attitude satisf. & trim required	
3.			Adjusts trim & relaxes elevator pressure

SITUATION Aircraft flying str. & level, following vectors at glide slope intercept altitude, flaps as needed, landing gear retracted, radios tuned, intercepting localizer from left.

TASK NO. Cpi-2 **TASK** Fly ILS with raw nav. display

TASK GOAL To fly aircraft to decision height (DH) **DATE** July, 1974

NOTE: A/S decrease in bank negligible & not perceptible (NP)

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(Z)	ESTABLISHES STEADY STATE		
1.	Visual ADI- Pitch: climb Bank: level Tach- constant rpm HSI- constant T/S- str. & wings level A/S- constant VV - constant rate climb Alt- climb Aural-Normal envir. sound Control-Neutral pressure Motion-Normal G		Cpi-2(z) 0 1 V 1C T-8 2 L-1 MC SJ 3 EA — —
2.		Determines missed approach satisf.	
3.			Maintains climb control

APPENDIX B

CLASSIFICATION OF INSTRUMENT FLYING TASKS WITHIN THE TAXONOMY

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CLASSIFICATION OF INSTRUMENT FLYING TASKS WITHIN THE TAXONOMY

Surface task analyses were prepared for 16 instrument flying tasks. These tasks included 14 fundamental transitions and 2 composite transitional tasks, the Vertical SD and the instrument approach to landing. The tasks were classified and the resultant skill cards categorized within the taxonomic matrix. The instrument tasks added 110 additional skills to the matrix for a total of 417 flying skills within the taxonomy system.

Instrument Task Operations - Classification of the 14 fundamental transitional instrument tasks yielded 74 skills while classification of the two composite transitions identified 36 skills. Table B-1 compares the skill distribution by rules for both the fundamental instrument tasks and corresponding contact flying tasks completed during an earlier effort. Table B-2 compares the skill distribution by rules for both the composite instrument tasks and corresponding contact flying tasks also completed earlier. These two comparison tables indicated that data trends established in classification of contact flying tasks changed to some degree for the instrument tasks. There was a trend toward a greater number of simple judgments during the performance of fundamental and composite instrument transitions.

A total of 27 sorting slots were used to classify the instrument tasks. Eight of these slots were specific to instrument flying and had not been utilized in the categorization of contact skills. A new effector output combination also was found which was peculiar to instrument tasks. The new output combination was coordinated aileron and rudder with coordinated elevator and throttle. This effector combination was found in the Vertical SD, but not in the instrument approach.

Generally, however, the organization of skills as defined by the number of skill cards in sorting slots, was found to be similar to contact tasks. Figure B-1 presents the distribution of skills in matrix slots and compares the newly incorporated instrument skills with the contact skills.

Table B-1. Comparison of Skills Identified in Contact and Instrument Fundamental Task Data

FUNDAMENTAL TRANSITIONAL INSTRUMENT TASKS FI-1 thru FI-14 (74 Skills)

SIMPLE JUDGMENT 60				COMPLEX JUDGMENT 14			
ESTABLISH ATTITUDE 46		ESTAB. RATE OF ATT. CHANGE 14		ESTABLISH ATTITUDE 0		ESTAB. RATE OF ATT. CHANGE 14	
Multi-Cue Process 42	Recall Process 0	Multi-Cue Process 0	Recall Process 14	Multi-Cue Process 0	Recall Process 0	Multi-Cue Process 14	Recall Process 0
Spec. Cue Process 4	Iter-ative Process 0	Spec. Cue Process 0	Iter-ative Process 0	Spec. Cue Process 0	Iter-ative Process 0	Spec. Cue Process 0	Iter-ative Process 0

FUNDAMENTAL TRANSITIONAL TASKS F-1 thru F-14 (Total of 70 Skills)

SIMPLE JUDGMENT 47				COMPLEX JUDGMENT 23			
ESTABLISH ATTITUDE 34		ESTAB. RATE OF ATT. CHANGE 13		ESTABLISH ATTITUDE 9		ESTAB. RATE OF ATT. CHANGE 14	
Multi-Cue Process 33	Recall Process 1	Multi-Cue Process 13	Recall Process 0	Multi-Cue Process 8	Recall Process 1	Multi-Cue Process 14	Recall Process 0
Spec. Cue Process 0	Iter-ative Process 0	Spec. Cue Process 0	Iter-ative Process 0	Spec. Cue Process 0	Iter-ative Process 0	Spec. Cue Process 0	Iter-ative Process 0

Table B-2. Comparison of Skills Identified in Contact and Instrument Composite Task Data

COMPOSITE TRANSITIONAL INSTRUMENT TASKS Cpi-1 & Cpi-2 (36 Skills)

SIMPLE JUDGMENT 16				COMPLEX JUDGMENT 20			
ESTABLISH ATTITUDE 12		ESTAB. RATE OF ATT. CHANGE 4		ESTABLISH ATTITUDE 8		ESTAB. RATE OF ATT. CHANGE 12	
Multi-Cue Process 8	Recall Process 2	Multi-Cue Process 3	Recall Process 1	Multi-Cue Process 8	Recall Process 0	Multi-Cue Process 12	Recall Process 0
Spec. Cue Process 2	Iter-ative Process 0	Spec. Cue Process 0	Iter-ative Process 0	Spec. Cue Process 0	Iter-ative Process 0	Spec. Cue Process 0	Iter-ative Process 0

COMPOSITE TRANSITIONAL TASKS Cp-1 thru Cp-13 (Total of 139 Skills)

SIMPLE JUDGMENT 86				COMPLEX JUDGMENT 53			
ESTABLISH ATTITUDE 42		ESTAB RATE OF ATT. CHANGE 44		ESTABLISH ATTITUDE 16		ESTAB. RATE OF ATT. CHANGE 37	
Multi-Cue Process 27	Recall Process 11	Multi-Cue Process 25	Recall Process 14	Multi-Cue Process 13	Recall Process 2	Multi-Cue Process 33	Recall Process 4
Spec. Cue Process 2	Iter-ative Process 2	Spec. Cue Process 4	Iter-ative Process 1	Spec. Cue Process 0	Iter-ative Process 0	Spec. Cue Process 0	Iter-ative Process 0

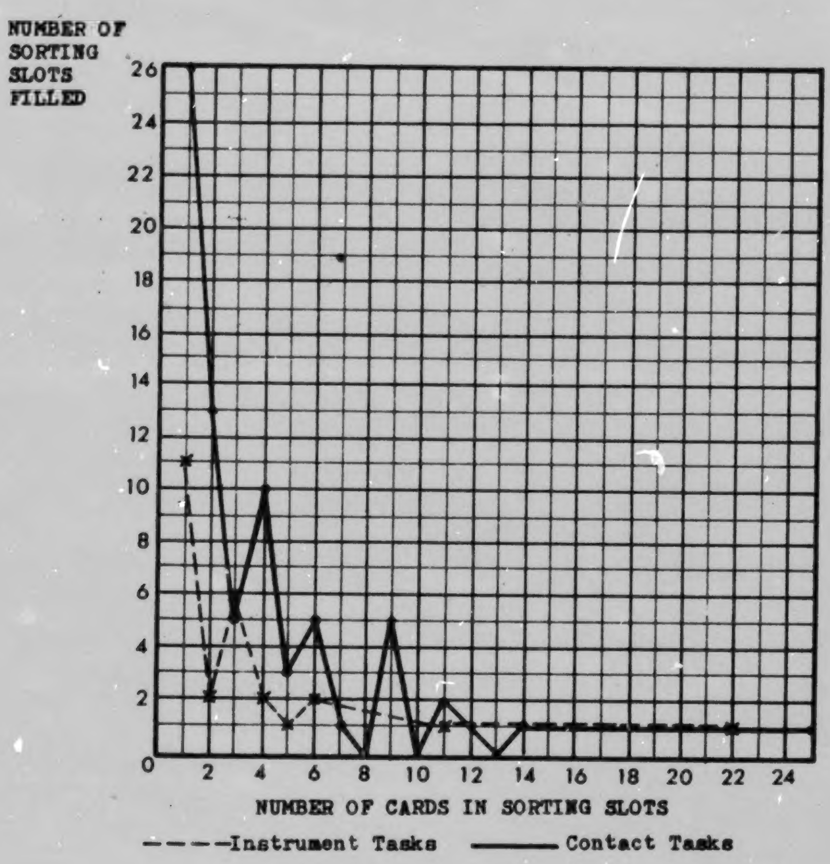


Figure B-1. Comparison of Skill Card Distribution Between Contact and Instrument Tasks

General Trends - The completed classification matrix found in Appendix D contains 180 sorting slots into which skill cards may be processed. The completed matrix consisted of 78 slots which contained one or more skill cards or 43% of the total possible matrix spread. It was evident that a majority of all skills were grouped within a manageable number of sorting slots. This indicated a logical simplicity within the data which could make an impact on current training methodology. Figure B-2 presents the relationship between the number of sorting slots containing one or more skill cards and the concentration of skill cards within 78 slots.

It should be noted that approximately 50% of all flying skills are contained within 11 slots and 92% of all flying skills categorized are contained in 49 sorting slots. These densely populated sorting slots also contain a major number of skill groups and single skills within them.

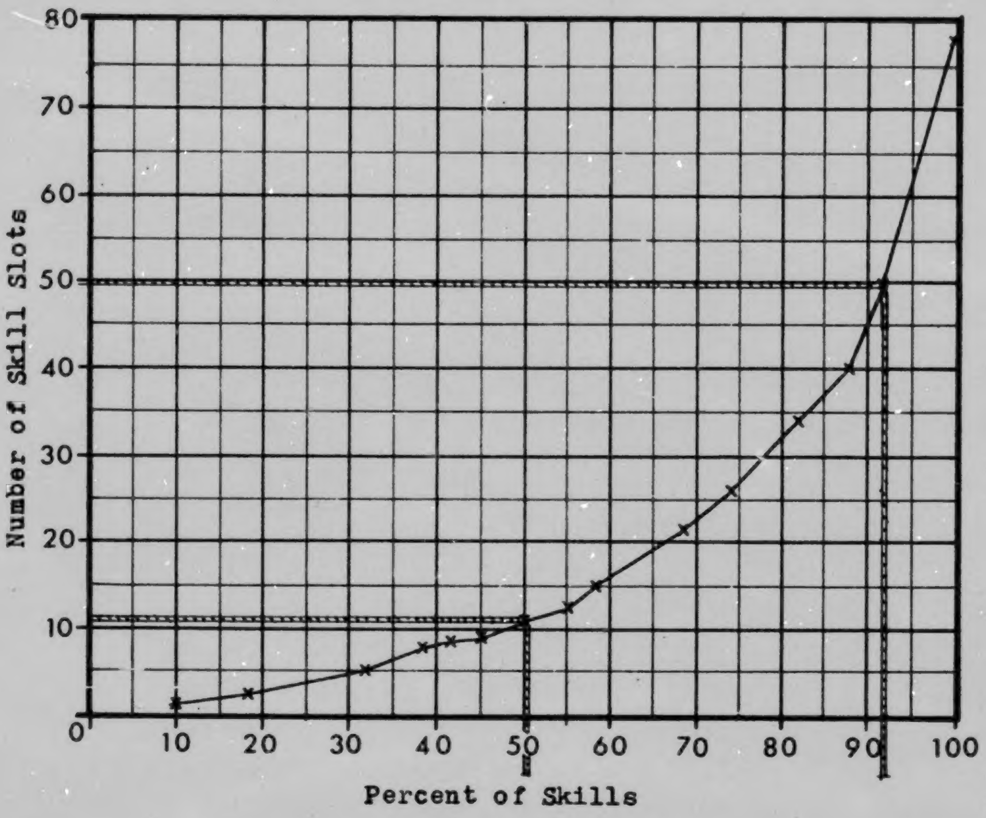


Figure B-2. Sorting Slots Filled as a Per Cent of Task Skills

APPENDIX C

ANALYSIS OF FUTURE UPT (FUPT) TRAINING OBJECTIVES

ANALYSIS OF FUTURE UPT (FUPT) TRAINING OBJECTIVES

The current UPT syllabus and the future undergraduate pilot training (FUPT) reports prepared by the Lockheed-California Company and Northrop Corporation, Hawthorne, California, were examined to compare and contrast current and future flying training objectives for the 1975-90 time frame. The results of the FUPT studies pointed toward substantially different training syllabus requirements for the future undergraduate pilot training program.

Current and Future Objectives - The Northrop Appendix (NOR 70-149) was of particular interest during the examination of the FUPT reports. This compilation of field surveys gathered training data from the operational command's Combat Crew Training Squadrons (CCTS). The major FUPT objective identified by the majority of commands surveyed was that future training should be directed more specifically to the needs and requirements of each command.

From the information contained in the reports, the basic objective of FUPT should be stated as the acquisition of general piloting skills in the context of representative operational missions and equipment. The present philosophy that UPT graduates must be capable of assignment to any aircraft in the Air Force inventory would require revision in order to be more responsive to the operational command needs. This idea is not new since this was also the conclusion of the Rand Pilot Training and Pilot-Career, Report 615 PR, December, 1970, that training should be more closely related to the ultimate operational mission. This basic recommendation would require major departures from current USAF practice with respect to training emphasis. A high degree of intra-command cooperation would also be necessary if such training innovations were to be implemented.

FUPT Requirement Matrix - As the review of FUPT training objectives continued, it became evident that there was more involved than the mere examination of the reports. A method was devised to integrate all data considered to be relevant to future flying training objectives. Two separate areas of the flying training spectrum were identified. The first area consisted of the newly identified syllabus items and the second consisted of the role of a total system simulation concept applied to the FUPT program.

The identification of new syllabus items went beyond the results of the 1975-90 studies. Additional training items were added in specific areas since equipment already developed or under development would have a definite impact on future UPT requirements. The simulation concept was totally relevant to this effort since it emphasized not only one of the principal areas of Air Force Human Resources Laboratory, Flying Training Division research, but also the substitution of simulation for in-flight training.

Figure C-1 illustrates the data contained in the 75-90 reports and additional FUPT requirements. This matrix underscores individual command needs with each having specific operational recommendations about the current syllabus. Because each command has its own unique mission and aircraft, some of the recommendations were in effect peculiar to that specific command. For example, SAC reported acrobatics as a non-essential skill, but TAC had no comment because TAC considers such training essential. SAC has said in effect, that its mission does not require a high skill level in acrobatics.

Another aspect of the matrix is the right hand portion which was purposely separated from the main body. It contains the future syllabus events that were specifically recommended in the FUPT reports plus those future training syllabus areas believed to represent recent aircraft and systems developments. In essence, the additions update the FUPT reports which were published in early 1971.

A direct comparison of the two segments by individual command suggests that a reasonable trade-off of training tasks would be possible. For those new tasks recommended by the 75-90 reports and this study effort, such as familiarization with radar equipment, area navigation and head-up displays, a system simulation concept takes on specific importance.

UPT Syllabus Verification - A systematic approach to the verification of the UPT syllabus is now possible by using the taxonomy to identify skills currently being taught in UPT and comparing them with the skills required in performing operational tasks. The identification of current UPT skills was accomplished during Phase II of this research effort. In order to identify operational skills, it would be necessary to perform a surface task analysis of those tasks in the training areas that have been identified by the major commands or pointed out as future training requirements. Once such surface task analyses were performed, they could be classified using the rules for classification developed for this taxonomy.

COMMAND AND AIRCRAFT TYPES PRESENT AND FUTURE	FUPT SYLLABUS REQUIREMENTS PECULIAR TO INDIVIDUAL COMMAND NEEDS (75 - 90 REPORTS)																	
	LOOP	BARREL ROLL	IMMELMANN	CUBAN-8	CLOVER LEAF	VOR TRACK	VOR STATION PASS	HOLDING VOR	VOR INTERCEPT	PENETRATION VOR	ADF	PITCHOUT	REJOIN	ECHELON TURNS	CROSS UNDER	TRAIL TURNS	POSITION CHANGES	OVERSHOOT RECOV.
TAC A-7D, F-4, F-5 F-105, F-111 F-15						▨	▨	▨	▨	▨	▨							
ADC F-102, F-106 F-15B											▨							
TAC RECON. RF-4C, RF-15 RF-111												▨	▨	▨	▨	▨	▨	▨
TAC AIRLIFT C-130, V/STOL C-123, LIT											●							
SAC B-52, G&H FB-111, B-1	▨	▨	▨	▨	▨							▨	●	▨			●	●
SAC KC-135												▨	▨	▨	▨	▨	▨	▨

COMMAND AND AIRCRAFT TYPES PRESENT AND FUTURE	POSSIBLE SYLLABUS ADDITIONS (75 - 90 REPORTS)							
	COMBAT TACTICS	TACTICAL FORMAT.	ECM THREAT EQUIP.	AIR/GROUND DELIV.	AIR/AIR REFUEL	VFR LOW LVL. NAV.	RADAR	ADDED INSTRUM.
TAC A-7D, F-4, F-5 F-105, F-111 F-15	●	●	●	●	●	●	●	●
ADC F-102, F-106 F-15B	●	●			●		●	●
TAC RECON. RF-4C, RF-15 RF-111		▨			●			
TAC AIRLIFT C-130, V/STOL C-123, LIT								
SAC B-52, G&H FB-111, B-1		●			●	●		
SAC KC-135					●			●

COMMAND AND AIRCRAFT TYPES PRESENT AND FUTURE	POSSIBLE SYLLABUS ADDITIONS (this research effort)					
	AREA NAV.	INTEGRATED NAV.	ADV. DISPLAYS	STOL/VSTOL	ADV. CONTROLS	ENERGY MANEUV.
TAC A-7D, F-4, F-5 F-105, F-111 F-15						
ADC F-102, F-106 F-15B						
TAC RECON. RF-4C, RF-15 RF-111						
TAC AIRLIFT C-130, V/STOL C-123, LIT						
SAC B-52, G&H FB-111, B-1						
SAC KC-135						

▨ FUPT REPORT NON-ESSENTIAL SKILLS ● SPECIFIC FUPT REPORT RECOMMENDATIONS

Figure C-1. FUPT 1975 to 1990 Matrix

The classification results could then be compared with the skills already obtained from the current UPT syllabus. This would provide an objective measure of the adequacy of the current UPT syllabus in meeting the future skill requirements as identified by the major commands. Application of the taxonomic classification system would permit the learning specialist to quantitatively determine what skills, if any, should be added to the UPT syllabus. It should be emphasized that it would not be necessary to perform a complete surface task analysis on all future training requirement tasks before the classification could be done. Classification could be performed on any individual task sequence. In practice, however, all tasks in a major activity such as tactical formation or air-to-air or air-to-ground weapon delivery should be classified at once to preclude the identification of isolated behavioral elements.

This technique of determining necessary skills from a task analysis would provide the training specialist with a tool which could be used to develop a training program that would be specific with regard to teaching the skills needed by the pilot trainee to become operationally ready. A training program based on specific skill requirements would also increase transfer of training and thus require a shorter training period to bring the trainee to a specified level of operational proficiency. It should be pointed out that the objective of this type of training would be skill achievement rather than maneuver proficiency. Evaluation criteria for satisfactory performance would need to be developed so that the skills achieved by the student could be more accurately determined and so relieve the instructor of subjective judgments.

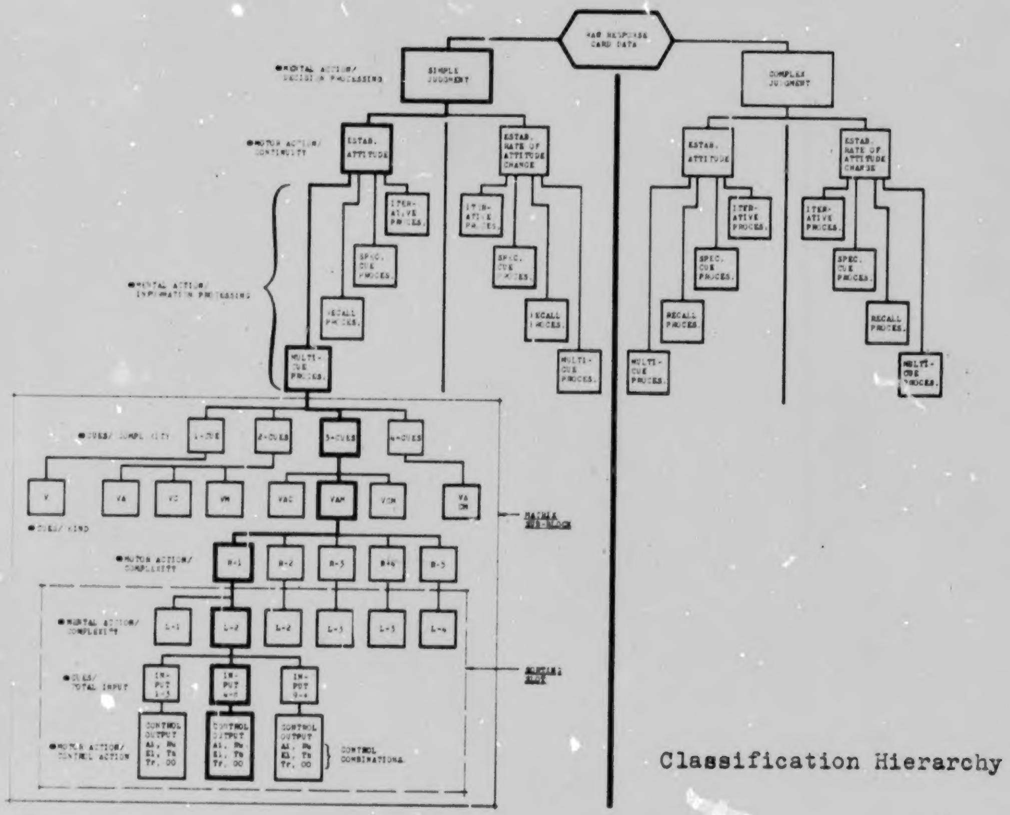
Potential Use of Simulation for UPT Requirements - There are many areas where additional training or increased emphasis in the UPT program would be desired by the operational commands. As has been shown in Figure C-1, areas in which one command would like to place more emphasis are the same areas which other commands would like to see emphasis reduced or eliminated. While this problem is not new, it is clearly illustrated that as weapon systems become more sophisticated, aircrew training must become more specialized to make effective use of the new equipment resources.

Inclusion of all training areas desired by all commands would be unfeasible because of cost and loss of training efficiency. Although this problem is beyond the scope of this research effort, the present preliminary investigation suggests that the introduction of operationally oriented flying training tasks would benefit both the student and the operational command to which he will eventually be assigned. An exposure to such flying tasks as air-to-air radar interception, air-to-ground weapon delivery, long range navigation, reconnaissance, strategic target detection and identification, if introduced early enough in the training program, could help determine the type of flying assignment for which the student was best suited. Another potential use of operational indoctrination training would be a concentrated training phase, geared toward the specific gaining command. This could be accomplished if the student's subsequent assignment was identified early enough to permit such a phase prior to graduation. While such training concepts would be impossible if they were attempted as a part of the flying training program, they would be feasible if provided through simulation. The advances in simulation capability and flexibility make the design and operation of multiple function flight simulators possible. One concept could use a modular cockpit design which could be easily changed for unique controls and displays. Flight dynamic characteristics could be programmable from a stored bank of vehicle models. Another concept could be the introduction of several part task simulator cockpits with one multichannel computer capable of supporting separate or simultaneous operation of all part task trainers.

As restrictions to flying increase because of more stringent airspace control, dwindling fuel allocations, and rising operational costs; greater emphasis on simulation for both normal and specialized training is a relative certainty during the 75-90 time frame. Investigation of new approaches in simulation for FUPT is a concept which the present study endorses as a potential course of action for addressing future training requirements.

APPENDIX D

TAXONOMIC DATA SYSTEM


RESPONSE CARD DATA
SIMPLE JUDGMENT
COMPLEX JUDGMENT
●MENTAL ACTION/ DECISION PROCESSING
●MOTOR ACTION/ CONTINUITY
ESTAB. ATTITUDE
ESTAB. RATE OF ATTITUDE CHANGE
ITER-ATIVE PROCES.
SPEC. CUE PROCES.
RECALL PROCES.
MULTI-CUE PROCES.
●MENTAL ACTION/ INFORMATION PROCESSING
●CUES/ COMPLEXITY
1-CUE
2-CUES
3-CUES
4-CUES
V
VA
VC
VM
VAC
VAM
VCM
VA CM
●CUES/ KIND
MATRIX SUB-BLOCK
●MOTOR ACTION/ COMPLEXITY
R-1
R-2
R-3
R-4
R-5
●MENTAL ACTION/ COMPLEXITY
L-1
L-2
L-2
L-3
L-3
L-4
●CUES/ TOTAL INPUT
IN-PUT 1-3
IN-PUT 4-8
IN-PUT 9-+
●MOTOR ACTION/ CONTROL ACTION
CONTROL OUTPUT Al, Ru El, Th Tr, OO
CONTROL COMBINATIONS

Classification Hierarchy

Classification Rules

1. Instructions for Cues Classification - Using Tables 1 and 2 enter the appropriate codes for cue classification in the blocks on line 1 of the Response Card.

First Block Across - List each kind of cue identified in the task sequence by its abbreviation. Do not list any cues described as Neutral or Normal in this block.

Second Block Across - Count the number of cues and write the appropriate number and code in the block.

Third Block Across - Read the Cue entry in the task sequence again. Notice that there may be more than one entry under each major kind of cue. Count each entry you find and write the appropriate number and code for the total input in this block.

2. Instructions for Mental Action Classification - Using Tables 1 and 2, enter the appropriate codes for Mental Action classification in the blocks on line 2 of the Response Card.

First Block Across - Note again the number of cues entered in block 2 of line 1. Now count the different control movements, pressures, and discrete actions in the Motor Action column of the task sequence of the Task Analysis.

*Enter L-1 for one cue with no control action.

*Enter L-2 for one or more cues with one or more non-coordinated control actions.

*Enter L-3 for one or more cues with coordinated control actions.

*Enter L-4 for two or more cues with coordinated and non-coordinated control actions.

Second Block Across - Read the entry in the Mental Action column of the task sequence. Each behavioral entry will begin with one of the words listed below at the left:

MENTAL ACTION		INFORMATION PROCESSING	
Observes.......	enter.....	Specific Cue Processing...	SC
Anticipates....	enter.....	Memory Recall Processing..	RP
Determines.....	enter.....	Multi-Cue Processing......	MC
Sustains.......	enter.....	Iterative Processing......	IP

Write the appropriate corresponding code indicated above in this block.

Third Block Across - Read the entry in the Mental Action column of the task sequence again. Determine if the action is a Simple Judgment SJ or a Complex Judgment CJ.

*Simple Judgment SJ - A decision for a motor action based on a specific cue or the specific recall of facts and procedures. (Example - The use of a specific reference such as an instrument value or ground position point at which to perform an action.)

*Complex Judgment CJ - A decision for a motor action estimated from the interpretation of cues and the interpretive recall of facts and procedures. (Example - Estimating when an action such as the roll out on the final turn should be performed.)

3. Instructions for Motor Action Classification - Again using Tables 1 and 2, enter the appropriate codes for the motor action classification in the blocks on line 3 of the Response Card.

First Block Across - Read the entry in the Motor Action column of this task sequence, then drop down and read the cues in the next sequence of the analysis. Determine if the cues and action establishes a specific aircraft attitude or rate of attitude change. List either the EA code for Establish Attitude or the ER code for Establish Rate of Attitude Change in this block according to the following:

*Establish Attitude EA - The condition in which the motor action produces stable (non-moving) pitch and bank cues. (Example - The stabilized pitch and bank attitude in an established turn.)

*Establish Rate of Attitude Change ER - The condition in which either a pitch or bank cue, or pitch and bank cues are moving continuously. (Example - The continuous pitch and bank movements present when going into a turn.)

Second Block Across - Read the Motor Action entry in the task sequence and list all the control outputs by writing the abbreviation of the control effected such as AI for Aileron or RU for Rudder in this block. Note also that a group of control outputs are grouped under the abbreviation OO, Other Outputs.

Third Block Across - Count the number of control outputs listed in the second block, then qualify and rank them as follows:

1st Rank........One output

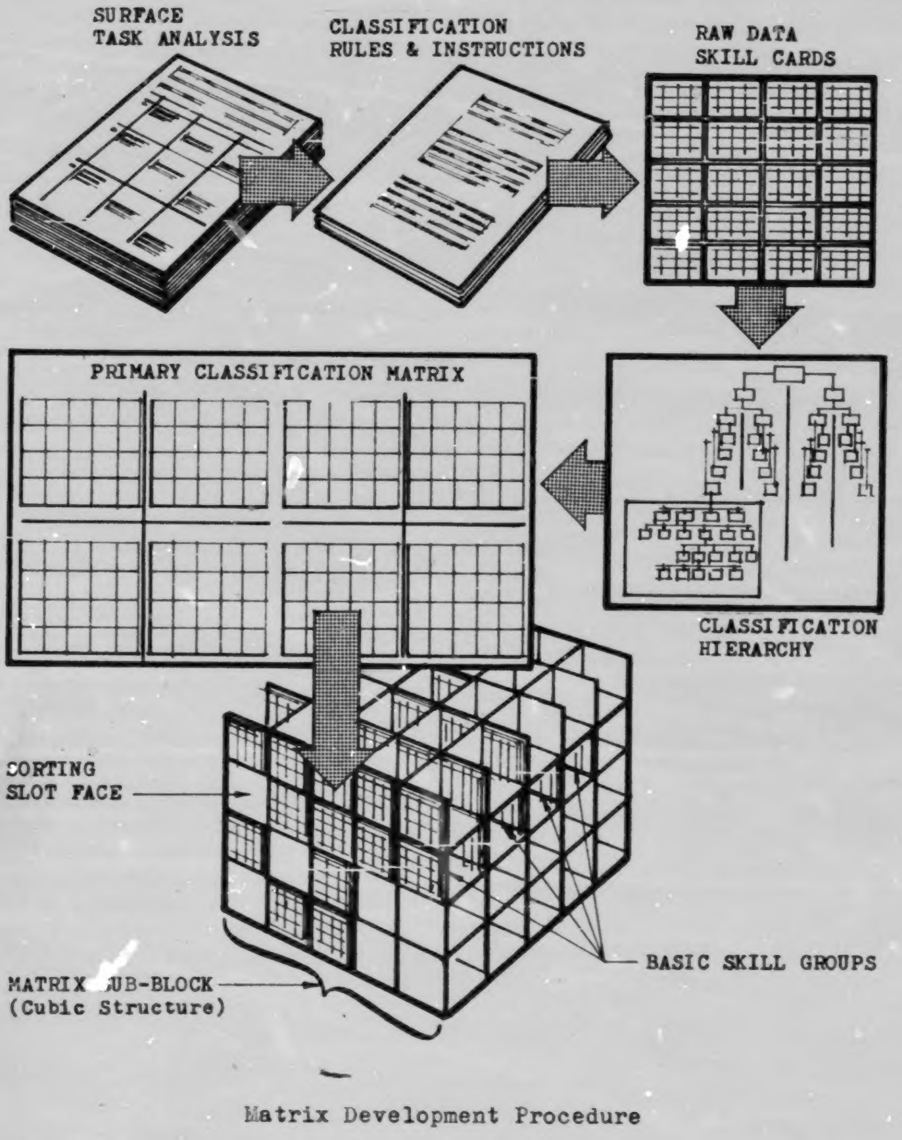
2nd Rank........Two or more non-coordinated outputs

3rd Rank........Two coordinated outputs

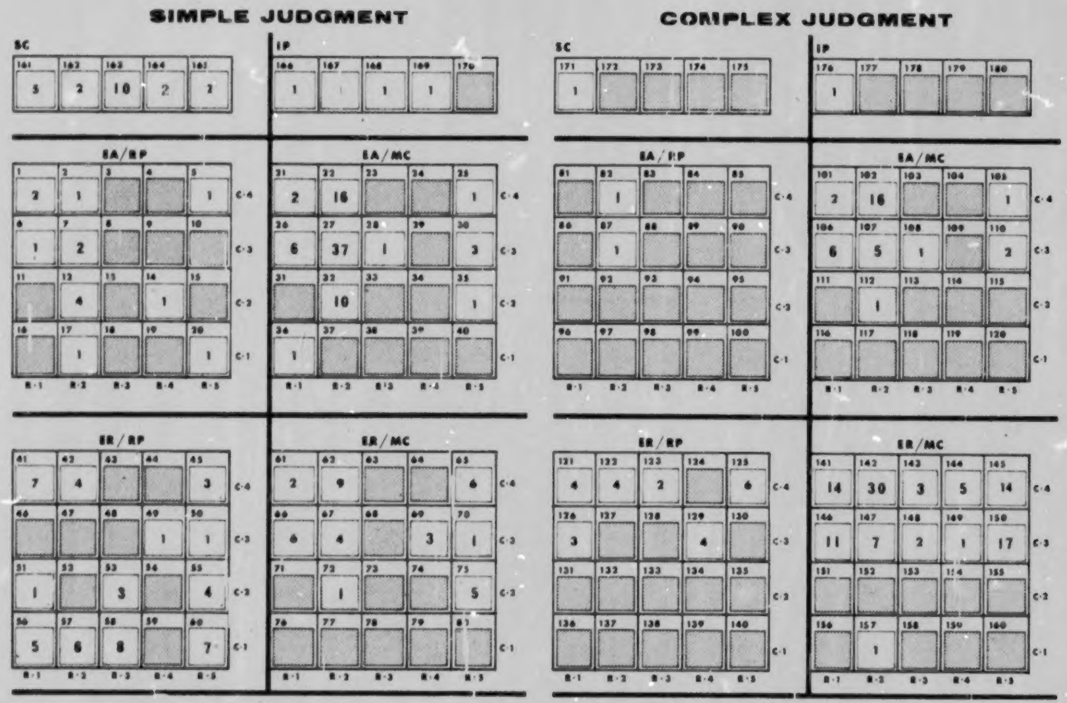
4th Rank........Three coordinated outputs

5th Rank........Coordinated and non-coordinated outputs

Write the appropriate corresponding number and code in this block.


SURFACE TASK ANALYSIS
CLASSIFICATION RULES & INSTRUCTIONS
RAW DATA SKILL CARDS
PRIMARY CLASSIFICATION MATRIX
CLASSIFICATION HIERARCHY
SORTING SLOT FACE
BASIC SKILL GROUPS
MATRIX SUB-BLOCK (Cubic Structure)

Matrix Development Procedure



SIMPLE JUDGMENT

SC

161 5	162 2	163 10	164 2	165 2

IP

166 1	167 1	168 1	169 1	170

EA/RP

1 2	2 1	3	4	5 1	C-4
6 1	7 2	8	9	10	C-3
11	12 4	13	14 1	15	C-2
16	17 1	18	19	20 1	C-1
R-1	R-2	R-3	R-4	R-5	

EA/MC

21 2	22 16	23	24	25 1	C-4
26 6	27 37	28 1	29	30 3	C-3
31	32 10	33	34	35 1	C-2
36 1	37	38	39	40	C-1
R-1	R-2	R-3	R-4	R-5	

ER/RP

41 7	42 4	43	44	45 3	C-4
46	47	48	49 1	50 1	C-3
51 1	52	53 3	54	55 4	C-2
56 5	57 6	58 8	59	60 7	C-1
R-1	R-2	R-3	R-4	R-5	

ER/MC

61 2	62 9	63	64	65 6	C-4
66 6	67 4	68	69 3	70 1	C-3
71	72 1	73	74	75 5	C-2
76	77	78	79	80	C-1
R-1	R-2	R-3	R-4	R-5	

COMPLEX JUDGMENT

SC

171 1	172	173	174	175

IP

176 1	177	178	179	180

EA/RP

81	82 1	83	84	85	C-4
86	87 1	88	89	90	C-3
91	92	93	94	95	C-2
96	97	98	99	100	C-1
R-1	R-2	R-3	R-4	R-5	

EA/MC

101 2	102 16	103	104	105 1	C-4
106 6	107 5	108 1	109	110 2	C-3
111	112 1	113	114	115	C-2
116	117	118	119	120	C-1
R-1	R-2	R-3	R-4	R-5	

ER/RP

121 4	122 4	123 2	124	125 6	C-4
126 3	127	128	129 4	130	C-3
131	132	133	134	135	C-2
136	137	138	139	140	C-1
R-1	R-2	R-3	R-4	R-5	

ER/MC

141 14	142 30	143 3	144 5	145 14	C-4
146 11	147 7	148 2	149 1	150 17	C-3
151	152	153	154	155	C-2
156	157 1	158	159	160	C-1
R-1	R-2	R-3	R-4	R-5	

Legend:
EA - Establish Attitude
ER - Establish Rate of Attitude Change
MC - Multi-Cue Processing
RP - Recall Processing
SC - Specific Cue Processing
IP - Iterative Processing

Classification Matrix

Sorting Slot Content List

Simple Judgment - EA/RP (Slot 1-20)			
Slot No.	Basic Skill Groups	Slot No.	Basic Skill Groups
1.	Cp-1(B)/ Ct-7(E)	11.	None
2.	Cp-8(I)	12.	Cp-9(A), Cp-10(A), Cp-11(A)
3.	None		Cp-12(A)
4.	None	13.	None
5.	Ct-1(M)	14.	Cp-1(A)
6.	Cp-5(D)	15.	None
7.	Cp-11(E)/ Cp-12(H)	16.	None
8.	None	17.	Cpi-2(A)
9.	None	18.	None
10.	None	19.	None
		20.	F-1(A)

Simple Judgment - EA/MC (Slots 21-40)			
Slot No.	Basic Skill Groups	Slot No.	Basic Skill Groups
21.	Cp-1(C)/ Cpi-2(S)	24.	None
22.	F-7(C), F-10(C), F-14(C)/	25.	Cp-1(M)
	Fi-3(C), Fi-5(E), Fi-6(C)	26.	Fi-2(C), Fi-5(C), Fi-7(C)
	Fi-9(C), Fi-10(C)/ F-14(D),		Fi-12(C)/ Cp-3(J), Cp-6(J)
	Cp-5(L), F-13(D), Ct-5(T)/	27.	F-2(D),F-3(D),F-4(D), F-5(D)
	Cp-1(K), Ct-2(L)/ F-4(C),		F-6(D), F-7(D), F-8(D), F-9(D),
	Cp-2(V)		F-10(D), F-11(D), F-12(D)/
23.	None		Fi-1(D), Fi-2(D), Fi-3(D),
			Fi-6(D), Fi-7(F), Fi-8(D),
	Continued on the next page.		Fi-9(D), Fi-10(D)

Sorting Slot Content List

Slot No.	Basic Skill Groups	Slot No.	Basic Skill Groups
27.	Fi-11(D), Fi-12(E), Fi-13(D)	30.	Cp-2(P)/ Cp-11(C)/ Cp-12(E)
	Fi-14(D)/ Fi-1(C), Fi-4(C),	31.	None
	Fi-8(C), Fi-11(C), Cpi-12(D)	32.	Cp-9(B), Cp-9(C), Cp-9(D),
	Cpi-12(H), Cpi-2(L), Cpi-2(P)/		Cp-9(E), Cp-12(I), Cp-9(F)
	Fi-13(C), Fi-14(C)/ Cp-12(C)		Cp-11(F), Cp-13(L), Ct-1(N)/
	Ct-6(M)/ F-1(D)/ F-13(C)		Fi-4(D)
28.	Cpi-1(J)	33.	None
29.	None	34.	None
		35.	Cp-1(L)
		36.	Ct-3(A)
			37-38-39-40 None

Simple Judgment -ER/RP (Slots 41-60)

Slot No.	Basic Skill Groups	Slot No.	Basic Skill Groups
41.	Cp-6(E), Ct-1(H), Ct-1(L),	51.	Fi-5(A)
	Ct-5(F)/ Cp-8(G), Ct-5(K)/	52.	None
	Ct-5(R)	53.	F-5(A), F-6(A)/ Fi-6(A)
42.	Cp-1(F)/ Cp-1(H)/ Cp-1(J)/	54.	None
	Cp-8(D)	55.	F-4(A)/Fi-4(A)/ Cp-4(H)/
43.	None		Cp-13(A)
44.	None	56.	Fi-2(A), Fi-7(A), Fi-12(A)/
45.	Cp-13(J)/ Ct-1(K)/Ct-(K)		Cp-5(A)/ Cp-8(A)
	46-47-48 None	57.	F-7(A), F-13(A), F-14(A),
49.	Ct-2(B)		Cp-6(A)/ Fi-13(A), Fi-14(A)
50.	Ct-3(C)		Continued on the next page.

Sorting Slot Content List

58.	F-2(A), F-3(A), F-9(A),	59.	None
	F-10(A), F-12(A)/ Fl-3(A)	60.	F-8(A), F-11(A), Cp-3(A),
	Fl-9(A), Fl-10(A)		Cp-4(A)/ Fl-1(A), Fl-8(A)
			Fl-11(A)

Simple Judgment - ER/MC (Slots 61-80)			
Slot No.	Basic Skill Groups	Slot No.	Basic Skill Groups
61.	Cp-5(H)/ Cp-3(B)	68.	None
62.	Cp-1(D), Cp-8(E), Cp-8(F)/	69.	Cpi-1(A)/ Cpi-1(E)/ Cp-13(G)
	Cp-2(I)/ Cp5(E)/ Cp-6(F)/	70.	Cpi-2(F)
	Cp-7(A)/ Cp-8(H)/ Ct-7(E)	71.	None
	63-64 None	72.	Cpi-2(V)
65.	Cp-1(I), Cp-2(G)/ Cp-7(E),		73-74 None
	Cp-12(G)/ Cp-12(F)/ Ct-7(G)	75.	Cp-10(B), Cp-11(B), Cp-12(B),
66.	Ct-1(C), Ct-4(C), Ct-5(C),		Cp-12(D)/ Cpi-2(B)
	Ct-6(C)/ Cp-6(K), Ct-7(C)		76-77-78 None
67.	Cp-2(H), Cp-5(K)/ Cp-10(D)		79-80 None
	Cp-11(D)		

Complex Judgment - EA/RP (Slots 81-100)			
Slot No.	Basic Skill Groups	Slot No.	Basic Skill Groups
81.	None		85-86 None
82.	Cp-2(T)	87.	Cp-10(E)
	83-84 None		88 thru 100 None

Sorting Slot Content List

Complex Judgment - EA/MC (Slots 101-120)

Slot No.	Basic Skill Groups	Slot No.	Basic Skill Groups
101.	Cp-5(G)/ Cp-5(J)		Cp-6(H)/ Cpi-2(E), Cpi-2(M)
102.	F-2(C), F-3(C), F-5(C), F-6(C)	107.	F-8(C), F-11(C)/ Cp-6(L)/
	F-9(C), F-12(C)/ Cp-2(U),		Cp-13(C)/ Cpi-2(T)
	Cpi-2(X)/ Cp-7(G), Cpi-1(C)/	108.	Ct-3(G)
	Ct-1(B), Cpi-2(Y)/ Ct-4(B)	109.	None
	Ct-5(B), Ct-6(B), Cp-13 (K)	110.	Cp-2(M)/ Cp-10(C)
	103-104 None	111.	None
105.	F-1(C)	112.	Cpi-2(R)
106.	Cp-5(C), Cp-6(C), Cp-6(D),		113-120 None

Complex Judgment - ER/RP (Slots 121-140)

Slot No.	Basic Skill Groups	Slot No.	Basic Skill Groups
121.	Ct-1(F), Ct-5(M), Ct-6(F)/	125.	Ct-4(F), Ct-5(H), Ct-5(O),
	Ct-4(K)		Ct-6(I), Ct-6(K)/ Cp-8(C)
122.	Ct-2(G), Ct-2(I), Ct-4(I)	126.	Ct-1(D), Ct-6(D)/ Cp-7(D)
	Ct-6(L)		127-128 None
123.	Ct-5(I), Ct-5(P)	129.	Cp-13(F), Ct-3(E), Ct-3(F)/
124.	None		Ct-2(E)

Complex Judgment - ER/MC (Slots 141-160)

Slots No.	Basic Skill Groups	Slots No.	Basic Skill Groups
141.	F-13(B), F-14(B), Ct-1(G),		Fi-13(B), Fi-14(G), Cpi-12(W)/
	Ct-1(I), Ct-4(L), Ct-5(G)		Cp-6(B), Cp-6(G)
	Ct-5(N), Ct-6(H), Ct-6(G)/		Continued on the next page.

Sorting Slot Content List

Slot No.	Basic Skill Groups	Slot No.	Basic Skill Groups
142.	F-2(B),F-3(B), F-5(B), F-6(B),	145.	Cp-1(G), Cp-7(B), Cp-7(C)
	F-7(B),F-13(B), F-10(B),		Cp-8(B), Ct-2(H), Ct-4(H),
	F-12(B), Ct-5(S)/ Ct-1(E),		Ct-7(I)/ Cp-2(B), Cp-2(C),
	Ct-5(E), Ct-5(L), Ct-6(E)/		Cp-2(E), Cp-2(F), Cp-2(L),
	Cp-2(J), Cp-2(S), Ct-4(J)/		Cp-2(O)/ Cp-2(K)
	Fi-3(B), Fi-6(B), Fi-9(B)	146.	Cp-3(D), Cp-3(H), Cp-5(B),
	Fi-10(B)/ Cp-7(F), Ct-7(H)/		Cp-6(I), Ct-7(D)/ Fi-2(B),
	Cp-1(E), Ct-7(B)/ Cpi-1(H)/		Fi-5(B), Fi-7(B), Fi-12(B)/
	Cp-5(F)/ Cp-13(B)/ Ct-4(E)/		Cp-3(I), Ct-5(D)
	Ct-6(J), Ct-7(L)	147.	Cp-3(B), Cp-3(F), Cp-4(B)
143.	Cpi-1(B), Cpi-1(F), Cpi-1(G)		Cp-4(F)/F-11(B)/ Cp-5(I)
144.	Ct-2(F), Ct-2(J), Ct-2(K),		Ct-4(D)
	Ct-4(G)/ Ct-1(J)	148.	Cp-13(E)/Ct-3(D)
	151-152 None	149.	Ct-2(C)
	153-155 None	150.	Fi-1(B), Fi-4(B), Fi-8(B),
156.	None		Fi-11(B), Cpi-2(C), Cpi-2(G),
157.	Cp-2(R)		Cpi-2(J), Cpi-2(K), Cpi-2(N)
	158-160 None		Cpi-2(O)/ F-1(B), F-4(B)/
			F-8(B), Cp-3(C), Cp-4(E),
			Ct-2(D)/ Cp-2(N)

Simple Judgment - ER/SC (Slots 161-165)			
Slot No.	Basic Skill Group	Slot No.	Basic Skill Group
161.	Ct-1(A), Ct-4(A), Ct-5(A)	162.	Cp-2(A), Ct-2(A)
	Ct-6(A), Ct-7(A)		Continued on the next page.

Sorting Slot Content List

Slot No.	Basic Skill Group	Slot No.	Basic Skill Group
163.	Fi-2(D), Fi-5(D), Fi-7(D),	164.	Cp-3(E), Cp-13(I)
	Fi-12(D)/ Cp-4(C), Cp-4(D)	165.	Ct-5(J), Ct-5(Q)
	Cp-4(G)/ Cpi-1(D)/ Cpi-1(I)/		
	Ct-4(M)		

Simple Judgment ER/IP(Slots 166-167)			
166.	Cp-2(D)	167.	Ct-7(J)

Simple Judgment EA/IP(Slots 168-169)			
168.	Cp-13(D)	169.	Cp-13(H)
		170.	None

Complex Judgment EA/SC(Slots 171-175)			
171.	Ct-7(M)		172-175 None

Complex Judgment EA/IP(Slots 176-180)			
176.	Cp-2(Q)		177-180 None

TASK NUMBERING LIST

Fundamental Transitions

F-1	St & L → T	F-8	C → T
F-2	St & L → C	F-9	C → D
F-3	St & L → D	F-10	D → St & L
F-4	T → St & L	F-11	D → T
F-5	T → C	F-12	D → C
F-6	T → D	F-13	St & L/ Cruise → Low Cruise
F-7	C → St & L	F-14	St & L/ Low Cruise → Cruise

Fundamental Instrument Transitions

Fi-1	St & L → T	Fi-8	C → T
Fi-2	St & L → C	Fi-9	C → D
Fi-3	St & L → D	Fi-10	D → St & L
Fi-4	T → St & L	Fi-11	D → T
Fi-5	T → C	Fi-12	D → C
Fi-6	T → D	Fi-13	St & L/ Cruise → Low Cruise
Fi-7	C → St & L	Fi-14	St & L/ Low Cruise → Cruise

St & L - Straight & Level

C - Climb

D - Descend

T - Turn

TASK NUMBERING LIST

Composite Transitions

Cp-1	Takeoff & Climbout
Cp-2	360° Circling Approach & Landing
Cp-3	Chandelle
Cp-4	Lazy-8
Cp-5	Stall - Approach to Landing
Cp-6	Stall - Departure or Takeoff
Cp-7	Stall - Accelerated/High Speed
Cp-8	Spin Recovery
Cp-9	Formation - Straight & Level
Cp-10	Formation - Turn away from Wingman
Cp-11	Formation - Turn into Wingman
Cp-12	Formation - Cross Under
Cp-13	Formation - Rejoin

Composite Instrument Transitions

Cpi-1	Vertical SD
Cpi-2	Instrument Approach

Continuous Transitions

Ct-1	Loop	Ct-4	Clover Leaf
Ct-2	Barrel Roll	Ct-5	Cuban 8
Ct-3	Aileron Roll	Ct-6	Immelmann

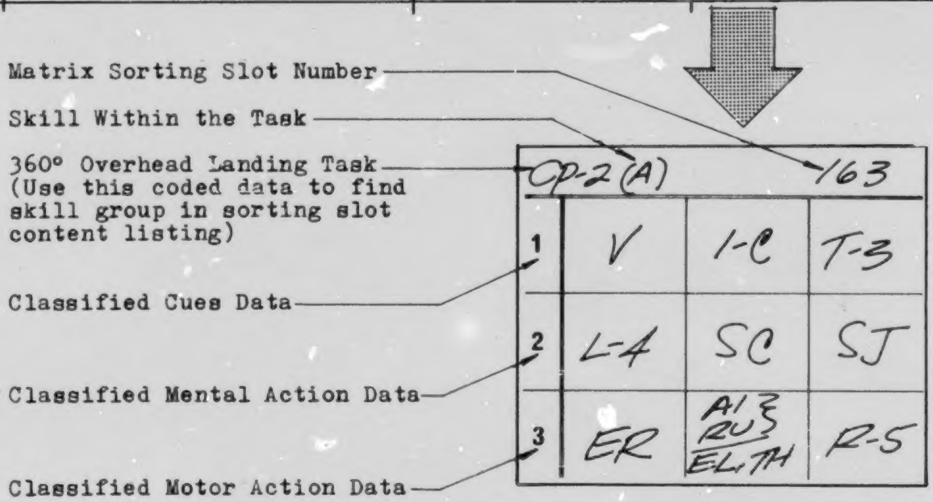
Ct-7 Vertical Recovery

SITUATION Aircraft at initial approach speed, level and maintaining ground track over centerline

TASK NO. Cp-2 **TASK** 360° overhead landing

TASK GOAL Land aircraft **DATE** Oct., 1973

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(A) 1.	BEGINS PITCH OUT Visual-Pitch att: cruise Bank att: level Outside ref, approaching pitch out point Aural-Normal envir. sound Control-Neutral pressure Motion-Normal G		Cp-2(A) 163 1 V 1-C T-3 2 L-4 SC SJ 3 ER AI RU EL,TH R-5
2.		Observes pitch out point	
3.			Coordinates aileron & rudder, moves elevator, adjusts throttle


Matrix Sorting Slot Number
Skill Within the Task
360° Overhead Landing Task (Use this coded data to find skill group in sorting slot content listing)
Classified Cues Data
Classified Mental Action Data
Classified Motor Action Data
Cp-2 (A)
163
1
V
1-C
T-3
2
L-4
SC
SJ
3
ER
AI RU EL,TH
R-5

File Card

Surface Analysis Relationship

APPENDIX E

EXAMPLE TWO DATA

SKILL DIFFICULTY INDEX

Task	Skill	Diff. Index
F-1	(A)	20
F-1	(B)	32
F-1	(C)	34
F-1	(D)	22
Mean of 27.00		
F-6	(A)	19
F-6	(B)	26
F-6	(C)	25
F-6	(D)	20
Mean of 22.50		
Cp-1	(A)	22
	B	22
	C	22
	D	26
	E	28
	F	23
	G	33
	H	24
	I	32
	J	27
	K	26
	L	25
Mean of 25.83		
Cp-7	(A)	22
	B	35
	C	35
	D	23
	E	32
	F	30
	G	28
Mean of 29.29		
Cp-11	(A)	19
	B	26
	C	32
	D	26
	E	24
	F	21
Mean of 24.67		

Task	Skill	Diff. Index
F-2	(A)	17
F-2	(B)	26
F-2	(C)	25
F-2	(D)	21
Mean of 22.25		
F-8	(A)	22
F-8	B	30
F-8	C	25
F-8	D	21
Mean of 24.50		
Cp-2	(A)	22
	B	35
	C	36
	D	21
	E	32
	F	34
	G	34
	H	24
	I	27
	J	27
	K	34
	L	36
	M	30
	N	29
	O	33
	P	28
	Q	19
	R	19
	S	27
	T	23
	U	28
	V	25
Mean of 28.32		

SKILL DIFFICULTY INDEX

Task	Skill	Diff. Index
Ct-1	(A)	17
	B	27
	C	20
	D	21
	E	25
	F	22
	G	24
	H	22
	I	24
	J	30
	K	31
	L	22
	M	25
	N	28

Mean of 24.14

Task	Skill	Diff. Index
Ct-3	(A)	14
	B	21
	C	26
	D	27
	E	28
	F	28
	G	26

Mean of 24.29

Task	Skill	Diff. Index
Ct-6	(A)	17
	B	27
	C	20
	D	21
	E	25
	F	22
	G	24
	H	23
	I	30
	J	27
	K	22
	L	28
	M	25

Mean of 23.92

APPENDIX F

EXAMPLE THREE DATA

EFFECTOR OUTPUT COMBINATIONS FOR CONTACT FLYING TASKS BY FREQUENCY

	Effector Combination	Number
1.	El	49
2.	$\begin{array}{c}\left.\begin{array}{c}\mathrm{Ai}\\\mathrm{Ru}\end{array}\right\}\\\hline\mathrm{El}\end{array}$	40
3.	$\begin{array}{c}\mathrm{Th}\\\hline\mathrm{El}\end{array}$	33
4.	$\begin{array}{c}\mathrm{Tr}\\\hline\mathrm{Th}\end{array}$	25
5.	Ai,Ru El,Th	25
6.	$\begin{array}{c}\mathrm{Ai}\\\hline\mathrm{Ru}\\\hline\mathrm{El}\end{array}$	22
7.	$\left.\begin{array}{c}\mathrm{El}\\\mathrm{Th}\end{array}\right\}$	13
8.	$\left.\begin{array}{c}\mathrm{Ai}\\\hline\mathrm{Ru}\\\hline\mathrm{El}\end{array}\right\}$	13
9.	$\begin{array}{c}\left.\begin{array}{c}\mathrm{Ai}\\\mathrm{Ru}\end{array}\right\}\\\hline\mathrm{El}\\\hline\mathrm{Th}\end{array}$	10
10.	$\begin{array}{c}\mathrm{El}\\\hline\mathrm{Ru}\end{array}$	8
11.	$\begin{array}{c}\mathrm{El}\\\hline\mathrm{OO}\end{array}$	7
12.	$\begin{array}{c}\left.\begin{array}{c}\mathrm{Ai}\\\mathrm{Ru}\\\mathrm{El}\end{array}\right\}\\\hline\mathrm{Th}\end{array}$	6
13.	$\begin{array}{c}\mathrm{Ai}\\\hline\mathrm{El}\end{array}$	6
14.	$\begin{array}{c}\mathrm{Ai}\\\hline\mathrm{Ru}\end{array}$	5
15.	$\begin{array}{c}\mathrm{Ru}\\\hline\mathrm{OO}\end{array}$	1
16.	$\begin{array}{c}\left.\begin{array}{c}\mathrm{El}\\\mathrm{Th}\end{array}\right\}\\\hline\mathrm{Ai}\\\hline\mathrm{Ru}\end{array}$	1
17.	$\begin{array}{c}\mathrm{OO}\\\hline\mathrm{OO}\\\hline\mathrm{Th}\end{array}$	1
18.	Th	1
19.	$\begin{array}{c}\mathrm{Ai}\\\hline\mathrm{Ru}\\\hline\mathrm{OO}\\\hline\mathrm{El}\end{array}$	1
20.	$\begin{array}{c}\mathrm{Ai}\\\hline\mathrm{Th}\end{array}$	1
21.	$\begin{array}{c}\left.\begin{array}{c}\mathrm{Ai}\\\mathrm{Ru}\\\mathrm{El}\end{array}\right\}\\\hline\mathrm{OO}\end{array}$	1
22.	$\begin{array}{c}\mathrm{El}\\\hline\mathrm{OO}\\\hline\mathrm{OO}\\\hline\mathrm{OO}\end{array}$	1
23.	$\begin{array}{c}\left.\begin{array}{c}\mathrm{El}\\\mathrm{Ru}\\\mathrm{El}\end{array}\right\}\\\hline\mathrm{Th}\end{array}$	1

Legend:

El - Elevator
Ai - Aileron
Ru - Rudder
- Non-coordinated

Th - Throttle
Tr - Trim
OO - Other Outputs
- Coordinated

DATA ACQUISITION AND ANALYSIS

I - Task Distribution of El Effector Outputs

(Ranked by the number of skills in a skill group)

Slot Number	Tasks and Skills	Number of Skills
141.	F-13(B), F-14(B), Cp-6(B) Ct-1(G), Ct-4(L), Ct-5(G) Ct-6(G), Ct-6(H)	8
146.	Cp-3(D), Cp-3(H), Cp-3(I) Cp-5(B), Cp-6(I), Ct-5(D) Ct-7(D)	7
66.	Cp-6(K), Ct-1(C), Ct-4(C) Ct-5(C), Ct-6(C), Ct-7(C)	6
106.	Cp-5(C), Cp-6(C), Cp-6(D) Cp-6(H)	4
41.	Cp-6(E), Ct-1(H), Ct-1(L) Ct-5(F)	4
121.	Ct-1(F), Ct-4(K), Ct-5(M) Ct-6(F)	3
101.	Cp-5(G), Cp-5(J)	2
126.	Ct-1(D), Ct-6(D)	2
61.	Cp-5(H), Ct-3(B)	2
26.	Cp-3(J), Cp-6(J)	2
56.	Cp-5(A), Cp-8(A)	2
166.	Cp-2(D)	1
6.	Cp-5(D)	1
126.	Cp-7(D)	1
168.	Cp-13(D)	1
41.	Ct-5(R)	1
1.	Ct-7(E)	1
167.	Ct-7(J)	1
	Total Skills - - - - - -	49

II -Task/Skill Summary

(Breakdown shows number of elevator effectors contained in specific tasks)

2-Fundamental Transitional Tasks

F-13(A) - 1 of 5 skills has El effector output
F-14(A) - 1 of 5 skills has El effector output

5-Composite Transitional Tasks

Cp-3(D) Cp-3(H)	Cp-3(I) Cp-3(J)	4 of 11 skills have El effector outputs
Cp-5(A) Cp-5(B) Cp-5(C) Cp-5(D)	Cp-5(G) Cp-5(H) Cp-5(J)	7 of 13 skills have El effector outputs
Cp-6(B) Cp-6(C) Cp-6(D) Cp-6(E)	Cp-6(I) Cp-6(H) Cp-6(J) Cp-6(K)	8 of 13 skills have El effector outputs

Cp-7(D) - 1 of 8 skills has El effector output
Cp-8(A) - 1 of 10 skills has El effector output

6-Continuous Transitional Tasks

Ct-1(C) Ct-1(D) Ct-1(F)	Ct-1(G) Ct-1(H) Ct-1(L)	6 of 15 skills have El effector outputs

Ct-3(B) - 1 of 8 skills has El effector output

Ct-4(C) Ct-4(K)	Ct-4(L)	3 of 13 skills have El effector outputs
Ct-5(C) Ct-5(F) Ct-5(G)	Ct-5(J) Ct-5(M) Ct-5(R)	6 of 21 skills have El effector outputs
Ct-6(C) Ct-6(D) Ct-6(F)	Ct-6(G) Ct-6(H)	5 of 15 skills have El effector outputs
Ct-7(C) Ct-7(D)	Ct-7(E)	3 of 15 skills have El effector outputs

III - Behavioral Categories in Skill Groups involving E1 outputs

(Ranked by the number of skills in a skill group)

Slot 141. 8

VA CM	4-C	T-8
L-2	MC	CJ
ER	E1	R-1

Slot 146. 7

VC M	3-C	T-7
L-2	MC	CJ
ER	E1	R-1

Slot 66. 6

VC M	3-C	T-6 or T-7
L-2	MC	SJ
ER	E1	R-1

Slot 106. 4

VC M	3-C	T-7
L-2	MC	CJ
EA	E1	R-1

Slot 41. 3

VC AM	4-C	T-7
L-2	RP	SJ
ER	E1	R-1

Slot 121. 3

VA CM	4-C	T-8
L-2	RP	CJ
ER	E1	R-1

Slot 101. 2

VA CM	4-C	T-9
L-2	MC	CJ
EA	E1	R-1

Slot 126. 2

VC M	3-C	T-7
L-2	RP	CJ
ER	E1	R-1

III - Behavioral Categories in Skill Groups involving E1 outputs

ked by the number of skills in a skill group)

Slot 61. 2

VA CM	4-C	T-7
L-2	MC	SJ
ER	E1	R-1

Slot 26. 2

VC M	3-C	T-6
L-2	MC	SJ
EA	E1	R-1

Slot 56. 2

V	1-C	T-2
L-1	RP	SJ
ER	E1	R-1

Slot 6. 1

VC M	3-C	T-7
L-2	RP	SJ
EA	E1	R-1

Slot 1. 1

VA CM	4-C	T-8
L-2	RP	SJ
EA	E1	R-1

Slot 126. 1

VC M	3-C	T-9
L-2	RP	CJ
ER	E1	R-1

Slot 41. 1

VA CM	4-C	T-9
L-2	RP	SJ
ER	E1	R-1

IV - Relationships of Skills & Skill Groups involving El effector outputs

	Task	Skill	Skill vs Aircraft Attitude
Slot 161.	(8 skills)		
	St & L Cruise to Low Cruise	F-13(B)	Skill involves decreasing pitch by decreasing elevator pressure.
	Departure Stall	Cp-6(B)	All skills involve increasing pitch at a satisfactory rate by maintaining constant elevator pressure.
	Clover Leaf	Ct-4(L)	
	Cuban 8	Ct-5(G)	
	Immelmann	Ct-6(H)	
	Low Cruise to High Cruise	F-14(B)	All skills involve increasing pitch rate by increasing elevator pressure.
	Loop	Ct-1(G)	
	Immelmann	Ct-6(G)	

SKILL GROUP FUNCTION: Complex judgment involving attitude change (up or down) without incremental control of airspeed, but with a concept of airspeed envelope.

	Task	Skill	Skill vs Aircraft Attitude
Slot 146.	(7 skills)		
	Chandelle	Cp-3(D) Cp-3(H) Cp-3(I)	Skills involve increasing or decreasing at a satisfactory rate by increasing or decreasing elevator pressure (small amounts of movement).
	Cuban 8	Ct-5(D)	
	Vert. Recovy	Ct-7(D)	Skills involve increasing or decreasing pitch at a satisfactory rate by maintaining constant elevator pressure.
	Departure Stall	Cp-6(G)	
	Landing Stall	Cp-5(B)	Skill involves gross elevator movement for satisfactory pitch rate control due to minimum airspeed.

SKILL GROUP FUNCTION: Complex judgment involving attitude change (up or down) without incremental control of airspeed, but with a firm concept of airspeed envelope. The motor actions range from none (maintaining pressure) to increase or relax (decrease) to move (gross) elevator control.

IV - Relationships of Skills & Skill Groups involving El effector outputs

Slot 106. (4 skills)

Task	Skill	Skill vs Aircraft Attitude
Landing Stall	Cp-5(C)	Skill involves pitch establishment at low airspeed with gross elevator movement.
Departure Stall	Cp-6(D)	
Departure Stall	Cp-6(C)	Skill involves pitch establishment at low airspeed with decrease of elevator pressure.
	Cp-6(H)	

SKILL GROUP FUNCTION: Complex judgment involving attitude establishment (up or down) with a firm concept of airspeed envelope until minimum airspeed is reached.

Slot 66. (6 skills)

Departure Stall	Cp-6(K)	
Loop	Ct-1(C)	All skills involve increasing pitch at a satisfactory rate through gross elevator movement due to need for large attitude change.
Clover Leaf	Ct-4(C)	
Cuban 8	Ct-5(C)	
Immelmann	Ct-6(C)	
Vert. Recovy	Ct-7(C)	

SKILL GROUP FUNCTION: Simple judgment involving large rotational attitude change near the beginning or end of maneuver.

Slot 41. (4 skills)

Departure Stall	Cp-6(E)	Skill involves gross elevator movement for satisfactory pitch rate control due to minimum airspeed.
Loop	Ct-1(H)	Skill involves increasing pitch at a satisfactory rate by maintaining constant elevator pressure.
	Ct-1(L)	
Cuban 8	Ct-5(F)	

SKILL GROUP FUNCTION: Simple judgment involving four basic motor actions - maintain, increase or decrease pressure or move elevator.

IV - Relationships of Skills & Skill Groups involving E1 effector outputs

	Task	Skill	Skill vs Aircraft Attitude
Slot 121.	(4 skills)		
	Loop	Ct-1(F)	Increase or decrease pressure involving pitch at a satisfactory rate.
	Clover Leaf	Ct-4(K)	
	Cuban 8	Ct-6(F)	
	Immelmann	Ct-5(M)	Maintains elevator pressure.

SKILL GROUP FUNCTION: Complex judgment using three basic motor actions involving pressure.

DATA ACQUISITION AND ANALYSIS

I - Task Distribution of $\overset{Th}{E1}$ Effector Outputs

(Ranked by the number of skills in a skill group)

Slot Number	Tasks and Skills	Number of Skills
142.	F-2(B), F-3(B), F-5(B), F-6(B), F-7(B), F-9(B), F-10(B), F-12(B), Ct-5(S)	9
102.	F-2(C), F-3(C), F-5(C), F-6(C), F-9(C), F-12(C)	6
57.	F-7(A), F-13(A), F-14(A), Cp-6(A)	4
142.	Cp-2(J), Cp-2(S), Ct-4(J)	3
22.	F-7(C), F-10(C), F-14(C)	3
62.	Cp-5(E), Cp-6(F)	2
27.	F-13(C)	1
157.	Cp-2(R)	1
147.	Ct-4(D)	1
82.	Cp-2(T)	1
176.	Cp-2(Q)	1
107.	Cp-6(L)	1
	Total Skills	33

II - Task/Skill Summary

(Breakdown shows number of $\frac{\text{Th}}{\text{El}}$ effector outputs contained in specific tasks.)

9-Fundamental Transitional Tasks

F-2(B)	F-2(C)	2 of 5 skills have $\frac{\text{Th}}{\text{El}}$ effector outputs
F-3(B)	F-3(C)	" " "
F-5(B)	F-5(C)	" " "
F-6(B)	F-6(C)	" " "
F-7(A) F-7(B)	F-7(C)	3 of 5 skills have $\frac{\text{Th}}{\text{El}}$ effector outputs
F-9(B)	F-9(C)	2 of 5 skills have $\frac{\text{Th}}{\text{El}}$ effector outputs
F-10(B)	F-10(C)	" " "
F-13(A)	F-13(B)	" " "
F-14(A)	F-14(C)	" " "

3-Composite Transitional Tasks

Cp-2(J) Cp-2(Q) Cp-2(R)	Cp-2(S) Cp-2(T)	5 of 23 skills have $\frac{\text{Th}}{\text{El}}$ effector outputs
Cp-5(E)		1 of 13 skills has $\frac{\text{Th}}{\text{El}}$ effector output
Cp-6(A) Cp-6(F)	Cp-6(L)	3 of 13 skills have $\frac{\text{Th}}{\text{El}}$ effector outputs

2-Continuous Transitional Tasks

Ct-4(D)	Ct-4(J)	2 of 8 skills have $\frac{\text{Th}}{\text{El}}$ effector outputs
Ct-5(S)		1 of 13 skills has $\frac{\text{Th}}{\text{El}}$ effector output

III - Behavioral Categories in Skill Groups involving $\frac{\text{Th}}{\text{EI}}$ outputs

(Ranked by the number of skills in a skill group.)

Slot 142. 9

VA CM	4-C	T-8
L-2	MC	CJ
ER	$\frac{\text{Th}}{\text{EI}}$	R-2

Slot 102. 5

VA CM	4-C	T-8
L-2	MC	CJ
EA	$\frac{\text{Th}}{\text{EI}}$	R-2

Slot 142. 3

VA CM	4-C	T-10
L-2	MC	CJ
ER	$\frac{\text{Th}}{\text{EI}}$	R-2

Slot 57. 3

V	1-C	T-2
L-2	RP	SJ
ER	$\frac{\text{Th}}{\text{EI}}$	R-2

Slot 22. 3

VA CM	4-C	T-8
L-2	MC	SJ
EA	$\frac{\text{Th}}{\text{EI}}$	R-2

Slot 82. 2

VC AM	4-C	T-8
L-2	RP	CJ
EA	$\frac{\text{Th}}{\text{EI}}$	R-2

III - Behavioral Categories in Skill Groups involving $\frac{Th}{EI}$ outputs

(Ranked by the number of skills in a skill group.)

Slot 62. 2

VA CM	4-C	T-6
L-2	MC	SJ
ER	$\frac{Th}{EI}$	R-2

Slot 147. 1

VC M	3-C	T-7
L-2	MC	CJ
ER	$\frac{Th}{EI}$	R-2

Slot 157. 1

V	1-C	T-4
L-2	MC	CJ
ER	$\frac{Th}{EI}$	R-2

Slot 17. 1

V	1-C	T-2
L-2	RP	SJ
EA	$\frac{Th}{EI}$	R-2

Slot 27. 1

V CM	3-C	T-6
L-2	MC	SJ
EA	$\frac{Th}{EI}$	R-2

Slot 107. 1

VC M	3-C	T-7 or T-6
L-2	MC	CJ
EA	$\frac{Th}{EI}$	R-2

IV - Relationships of Skills & Skill Groups involving $\frac{\text{Th}}{\text{El}}$ outputs

	Task	Skill	Skill vs Aircraft Attitude
Slot 124.	(9 skills)		
	St & L to C	F-2(B)	All skills are involved with increasing pitch & sequential power adjustment.
	T to C	*F-5(B)	
	D to St & L	F-10(B)	
	D to C	F-12(B)	
	Cuban 8	Ct-5(S)	
	St & L to D	F-3(B)	All skills are involved with decreasing pitch & sequential power adjustment.
	T to D	*F-6(B)	
	C to St & L	F-7(B)	
	C to D	F-9(B)	

SKILL GROUP FUNCTION: Complex judgment to approach a desired aircraft attitude by maintaining elevator pressure while holding required airspeed with power to accomplish a smooth rate of attitude change. The fundamental transitions are reversal skills of each other. *$\frac{\text{Th}}{\text{El}}$ skills involved in increasing or decreasing pitch attitude and power in a turn.

	Task	Skill	Skill vs Aircraft Attitude
Slot 102.	(6 skills)		
	St & L to C	F-2(C)	All skills are involved with the stabilization of climb, pitch & the completion of power adjustment.
	T to C	*F-5(C)	
	D to C	F-12(C)	
	St & L to D	F-3(C)	All skills are involved with the stabilization of descent, pitch & the completion of power adjustment.
	T to D	*F-6(C)	
	C to D	F-9(C)	

SKILL GROUP FUNCTION: Complex judgment to establish a desired attitude while holding a required airspeed. All fundamental skills are reversal skills of each other. *$\frac{\text{Th}}{\text{El}}$ skills involved in the establishment of increased or decreased pitch attitude and power in a turn.

IV - Relationships of Skills & Skill Groups
involving EI^{Th} Outputs

	Task	Skill	Skill vs Aircraft Attitude
Slot 142.	(3 skills)		
	Landing	Cp-2(J)	All skills are involved with increasing pitch & sequential power adjustment.
	Landing	Cp-2(S)	
	Clover Leaf	Cp-4(J)	

SKILL GROUP FUNCTION: Complex judgment to approach a desired attitude by maintaining elevator pressure while holding to a required airspeed with power to accomplish a smooth rate of attitude change.

	Task	Skill	Skill vs Aircraft Attitude
	(3 skills)		
Slot 22.	C to St & L	F-7(C)	All skills are involved with stabilization of pitch increase and the completion of power adjustment.
	D to St & L	F-10(C)	
	Low Cruise to Cruise	*F-14(C)	

SKILL GROUP FUNCTION: Simple judgment to establish the desired attitude while holding or *increasing to a required airspeed.

	Task	Skill	Skill vs Aircraft Attitude
Slot 57.	(3 skills)		
	C to St & L	F-7(A)	All skills begin a task involving pitch change & sequential power adjustment.
	Low Cruise to ST & L Cruise	F-13(A)	
	St & L Cruise to Low Cruise	F-14(A)	

SKILL GROUP FUNCTION: Simple judgment to begin approaching a desired attitude with varying amounts of elevator pressure, while holding to a required airspeed.

	Task	Skill	Skill vs Aircraft Attitude
Slot 62.	(2 skills)		
	Stall (Landing)	Cp-5(E)	All skills involve pitch attitude stall identification.
	Stall (Departure)	Cp-6(F)	

SKILL GROUP FUNCTION: Simple judgment to approach a desired attitude by elevator movement and adjustment of power to regain flying airspeed.

STANDARD TASK St-1

The following is a breakdown of the number and quantity of effector output combinations utilized in skills for the newly developed task.

$\frac{Th}{El}$ - 12*

$\frac{Tr}{El}$ - 9*

$\left.\begin{matrix}Th\\El\end{matrix}\right\}$ - 2*

El - 2*

25* Total

$\frac{\left.\begin{matrix}Ai\\Ru\end{matrix}\right\}}{El}$ - 4

$\frac{\left.\begin{matrix}Ai\\Ru\end{matrix}\right\}}{El, Th}$ - 4

$\frac{\frac{Ai}{Ru}}{El}$ - 3

$\frac{\left.\begin{matrix}Ai\\Ru\end{matrix}\right\}}{Th}$ - 1

12 Total

Twelve additional skills were required to maintain five steady-state conditions within the task. These skills were not considered in the skill emphasis because of the uncertainty of their description.

TASK FUNCTION: The task was developed to exercise skills associated with the starred effector output combinations shown in the breakdown. Sixty-eight per cent of the skills in St-1 relate directly to those combinations. The task was considered successful in that the number of skills relating to each output combination was consistent with the overall frequency of skills contained in the surface task analyses.

Twenty-two per cent of the skills in other effector output combinations were required for climbing and turning segments of the task in order to maintain flying continuity. The total of all effector outputs utilized in the task constitute nine of the ten most frequently used effector related skills found in flying training.

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. St-1 **TASK** Standard task for El, $\frac{Th}{El}$, $\frac{Tr}{El}$, $\frac{Th}{El}$ effector outputs

TASK GOAL To develop prescribed skills **DATE** July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(A) 1.	APPROACHES IP Visual-Pitch att: cruise Bank att: level Outside ref: IP, section line Aural-Normal envir. sound Control-Neutral pressure Motion- Normal G		St-1(A) 101* 1 V 1-C T-5 2 L-3 SC SJ 3 ER TH/EL R-3
2.		Observes position to start maneuver	
3.			Coordinates elevator & adjusts throttle
(B) 1.	STARTS PITCH DECREASE Visual-Pitch att:decreasing Bank att: level Instr. cross-check Aural-Change in envir. sound Control-Increased stick pressure & throttle reduction Motion-Negative G onset, pitching down		St-1 (B) 102* 1 VA CM 4-C T-8 2 L-2 MC CJ 3 ER TH/EL R-2
2.		Determines satisfactory pitch attitude movement	
3.			Maintains constant elevator pressure & continues throttle adjustment
(C) 1.	CONTINUES PITCH DECREASE Visual-Pitch att:decreasing Bank att: level Instr. cross-check Aural-Chge. in envir. sound Control-Constant stick pres., throttle reduction Motion-Constant negative G, pitching down		St-1 (C) 102 * 1 VA CM 4-C T-8 2 L-2 MC CJ 3 EA EL/TH R-2

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. St-1 TASK Standard task

TASK GOAL To develop prescribed skills DATE July, 1974

<table>
<tr><th>EL. SEQ.</th><th>CUES</th><th>MENTAL ACTION</th><th>MOTOR ACTION</th></tr>
<tr><td>(C)</td><td>CONTINUES PITCH DECREASE</td><td></td><td></td></tr>
<tr><td>2.</td><td></td><td>Determines descent attitude approaching to effect 1000' rate of descent</td><td></td></tr>
<tr><td>3.</td><td></td><td></td><td>Relaxes elevator pressure & stops throttle adjustment</td></tr>
<tr><td>(D)
1.</td><td>STOPS PITCH DECREASE
Visual-Pitch att: descent
Bank att: level
Outside reference
Instr. cross-check
Aural-Normal envir. sound
Control-Decreased stick pres.
Motion-Decreasing negative G,
pitch stabilized</td><td></td><td>St-1 (D) 27*<table><tr><td>1</td><td>V
CM</td><td>3-C</td><td>T-7</td></tr><tr><td>2</td><td>L-2</td><td>MC</td><td>SJ</td></tr><tr><td>3</td><td>EA</td><td>TE
EL</td><td>R-2</td></tr></table></td></tr>
<tr><td>2.</td><td></td><td>Determines trim required</td><td></td></tr>
<tr><td>3.</td><td></td><td></td><td>Adjusts trim & relaxes elevator pressure</td></tr>
<tr><td>(E)
1.</td><td>ESTABLISHES STEADY-STATE
Visual-Pitch att: descent
Bank att: level
Instr. cross-check
Aural-Normal envir. sound
Control-Neutral stick pres.
Motion-Normal G</td><td></td><td>St-1 (E) 0<table><tr><td>1</td><td>V</td><td>1-C</td><td>T-3</td></tr><tr><td>2</td><td>L-1</td><td>MC</td><td>SJ</td></tr><tr><td>3</td><td>EA</td><td>[illegible]</td><td>R-2</td></tr></table></td></tr>
<tr><td>2.</td><td></td><td>Determines steady-state rate of descent established</td><td></td></tr>
<tr><td>3.</td><td></td><td></td><td>Maintains descent control</td></tr>
</table>

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. St-1 TASK Standard task

TASK GOAL To develop prescribed skills DATE July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(F) 1.	MAINTAINS STEADY-STATE 1000' Visual-Pitch att: descent Bank att: level Outside reference Instr. cross-check Aural-Normal envir. sound Control-Neutral stick pres. Motion-Normal G	RATE-OF-DESCENT	St-1(F) 0 1 V 1-C T-3 2 L-1 1P SJ 3 EA [illegible]
2.		Sustains position relative to section line	
3.			Maintains descent control
(G) 1.	CONTINUES STEADY-STATE 1000' Visual-Pitch att: descent Bank att: level Outside reference Aural-Normal envir. sound Control-Neutral stick pres. Motion-Normal G	RATE-OF-DESCENT	St-1 (G) 0 1 V 1-V T-3 2 L-1 RP SJ 3 EA [illegible] R-1
2.		Anticipates transition to 1000'/min. climb to 17,000'	
3.			Maintains descent control
(H) 1.	STARTS TRANSITION TO CLIMB Visual-Pitch att: descent Bank att: level Outside reference Instr. cross-check Aural-Normal envir. sound Control-Neutral stick pres. Motion-Normal G		St-1 (H) 58* 1 ✓ 1-C 4-T 2 L-3 MC SJ 3 ER EL TH R-3
2.		Anticipates transition altitude, 16,000'approaching	
3.			Coordinates elevator & adjusts throttle

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. St-1 TASK Standard task

TASK GOAL To develop prescribed skills DATE July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(I) 1.	BEGINS CLIMB Visual-Pitch att:increasing Bank att: level Outside reference Instr. cross-check Aural-Chge. in envir. sound Control-Increased stick pres. & throttle advance Motion-Positive G onset, pitching up		St-1 (I) 42 1 VA CM · 4-C · T-9 2 L-2 · RP · SJ 3 ER · EL/TH · R-2
2.		Anticipates transition to constant speed climb	
3.			Maintains constant elevator pressure & adjusts throttle
(J) 1.	STARTS PITCH INCREASE Visual-Pitch att:increasing Bank att: level Instr. cross-check Aural-Chge. in envir. sound Control-Increased stick pres. & throttle advance Motion-Positive G onset, pitching up		St-1 (J) 142* 1 VA MC · 4-C · T-8 2 L-2 · MC · CJ 3 ER · TH/EL · R-2
2.		Determines satisf. pitch attitude movement	
3.			Maintains constant elevator pressure & continues throttle adjustment
(K) 1.	CONTINUES PITCH INCREASE Visual-Pitch att:increasing Bank att: level Instr. cross-check Aural-Chge. in envir. sound Control-Constant stick pres. & throttle advance Motion-Constant positive G, pitching up		St-1 (K) 102* 1 VA CM · 4-C · T-8 2 L-2 · MC · CJ 3 EA · EL/TH · R-2

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. St-1 TASK Standard task

TASK GOAL To develop prescribed skills DATE July, 1974

<table>
<tr><th>EL. SEQ.</th><th>CUES</th><th>MENTAL ACTION</th><th>MOTOR ACTION</th></tr>
<tr><td>(K)</td><td>CONTINUES PITCH INCREASE</td><td></td><td></td></tr>
<tr><td>2.</td><td></td><td>Determines climb attitude approaching & on section line</td><td></td></tr>
<tr><td>3.</td><td></td><td></td><td>Relaxes elevator & stops throttle adjustment</td></tr>
<tr><td>(L)
1.</td><td>STOPS PITCH INCREASE
Visual-Pitch att: climb
Bank att: level
Instr. cross-check
Aural-Normal envir. sound
Control-Constant stick pres.
Motion-Decreasing positive G, pitch stabilized</td><td></td><td>St-1(L) 27*<table><tr><td>1</td><td>V
CM</td><td>3-C</td><td>T-6</td></tr><tr><td>2</td><td>L-2</td><td>MC</td><td>SJ</td></tr><tr><td>3</td><td>EA</td><td>TE
EL</td><td>R-2</td></tr></table></td></tr>
<tr><td>2.</td><td></td><td>Determines need for trim</td><td></td></tr>
<tr><td>3.</td><td></td><td></td><td>Adjusts trim & relaxes elevator pressure</td></tr>
<tr><td>(M)
1.</td><td>ESTABLISHES STEADY-STATE
Visual-Pitch att: climb
Bank att: level
Aural-Normal envir. sound
Control-Neutral stick pres.
Motion-Normal G</td><td></td><td>St-1(M) 0<table><tr><td>1</td><td>V</td><td>1-C</td><td>T-2</td></tr><tr><td>2</td><td>L-1</td><td>MC</td><td>SJ</td></tr><tr><td>3</td><td>EA</td><td>Maintains climb control
[illegible]</td><td>R-1</td></tr></table></td></tr>
<tr><td>2.</td><td></td><td>Determines climb established</td><td></td></tr>
<tr><td>3.</td><td></td><td></td><td>Maintains climb control</td></tr>
<tr><td>(N)
1.</td><td>MAINTAINS STEADY-STATE CLIMB
Visual-Pitch att: climb
Bank att: level
Outside reference
Instr. cross-check
Aural-Normal envir. sound</td><td>1000'/MINUTE</td><td></td></tr>
</table>

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. St-1 TASK Standard task

TASK GOAL To develop prescribed skills DATE July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(N) 1.	MAINTAINS STEADY-STATE CLIMB Control-Neutral stick pres. Motion-Normal G	1000'/MINUTE	St-1 (N) O 1 V 1-C T-4 2 L-1 IP SJ 3 EA [illegible] R-1
2.		Sustains position relative to section line	
3.			Maintains climb control
(O) 1.	CONTINUES STEADY-STATE 1000' Visual-Pitch att: climb Bank att: level Outside reference Instr. cross-check Aural-Normal envir. sound Control-Neutral stick pres. Motion-Normal G	/MIN. RATE OF CLIMB	St-1 (O) O 1 V 1-C T-4 2 L-1 MC SJ 3 EA [illegible] R-1
2.		Determines transition to 1000'/min. climb to 18,000' approaching	
3.			Maintains climb control
(P) 1.	STARTS TRANSITION TO LEVEL Visual-Pitch att: climb Bank att: level Aural-Normal envir. sound Control-Neutral pressure Motion-Normal G	OFF AT 17,000'	St-1 (P) 57* 1 V 1-C T-2 2 L-2 RP SJ 3 ER TH/EL R-2
2.		Anticipates transition to level flight	
3.			Moves elevator & adjusts throttle

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. St-1 **TASK** Standard task

TASK GOAL To develop prescribed skills **DATE** July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(Q) 1.	STARTS PITCH DECREASE Visual-Pitch att:decreasing Bank att: level Instr. cross-check Aural-Chge. in envir. sound Control-Increased stick pres. & throttle reduction Motion-Negative G onset, pitching down		St-1 (Q) 142* 1 VA CM 4-C T-8 2 L-2 MC CJ 3 ER TH/EL R-2
2.		Determines satisf. pitch attitude movement	
3.			Maintains constant elevator pressure & continues throttle adjust.
(R) 1.	CONTINUES PITCH DECREASE Visual-Pitch att:decreasing Bank att: level Outside reference Aural-Chge in envir. sound Control-Constant stick pres. & throttle reduction Motion-Constant negative G, pitching down		St-1 (R) 108* 1 VA CM 4-C T-9 2 L-2 MC CJ 3 EA TH/EL R-2
2.		Determines correct pitch attitude approaching	
3.			Relaxes elevator pressure & stops throttle adjust.
(S) 1.	STOPS PITCH DECREASE Visual-Pitch att: cruise Bank att: level Instr. cross-check Aural-Normal envir. sound Control-Constant stick pres. Motion-Decreasing negative G, pitch stabilized		St-1 (S) 27* 1 V CM 3-C T-6 2 L-2 MC SJ 3 EA TR/EL R-2

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. St-1 **TASK** Standard task

TASK GOAL To develop prescribed skills **DATE** July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(S)	STOPS PITCH DECREASE		
2.		Determines trim required	
3.			Adjusts trim & relaxes elevator pressure
(T) 1.	ESTABLISHES STEADY-STATE 17,000' LEVEL Visual-Pitch att: cruise Bank att: level Outside reference Instr. cross-check Aural-Normal envir. sound Control-Neutral stick pres. Motion-Normal G		St-1(T) 0 1 V 1-C T-4 2 L-2 MC SJ 3 EA [illegible] R-2
2.		Determines level off achieved at desired altitude	
3.			Maintains cruise control
(U) 1.	STARTS CLIMBING TURN Visual-Pitch att: cruise Bank att: level Outside reference Instr. cross-check Aural-Normal envir. sound Control-Neutral stick pres. Motion-Normal G		St-1(U) 20 1 V 1-C T-4 2 L-4 RP SJ 3 EA [illegible] R-5
2.		Anticipates left climbing turn, 180°, 500'/minute	
3.			Coordinates aileron & rudder, moves elevator, adjusts throttle

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. St-1 **TASK** Standard task

TASK GOAL To develop prescribed skills **DATE** July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(V) 1.	CONTINUES ROLL INTO CLIMBING TURN Visual-Pitch att: climb Bank att: rolling Outside reference Aural-Chge in envir. sound Control-Increased stick & rudder pressure, throttle advance Motion-Positive G onset, pitching up, rolling		St-1 (V) 145 1 VA CM A-C T-10 2 L-4 MC CJ 3 ER AI RU EL R-S
2.		Determines satisf. roll rate	
3.			Maintains coord. aileron & rudder pressure, increases elevator pressure
(W) 1.	CONTINUES ROLL AND CLIMB Visual-Pitch att: climb Bank att: rolling Outside reference Instr. cross-check Aural-Chge. in envir. sound Control-Constant aileron & rudder pressure, increased elevator pressure Motion-Increasing positive G, pitching up, rolling		St-1 (W) 142 1 VA CM A-C T-11 2 L-4 MC CJ. 3 EA AI RU EL R-S
2.		Determines proper bank & climb attitude approaching	
3.			Moves aileron & elevator, relaxes rudder pressure

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. St-1 TASK Standard task

TASK GOAL To develop prescribed skills DATE July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(X) 1.	STOPS ROLL AND CLIMB Visual-Pitch att: climb Bank att: constant 45° Instr. cross-check Aural-Normal envir. sound Control-Neutral aileron & rudder pressure, constant elevator pressure Motion-Constant positive G, roll stabilized		St-1 (X) 27* 1 V CM 3-C T-6 2 L-2 MC SJ 3 EA TR/EL R-2
2.		Determines desired bank angle & rate of climb achieved, & need for trim	
3.			Adjusts trim & relaxes elevator pressure
(Y) 1.	CONTINUES STEADY-STATE CLIMBING TURN Visual-Pitch att: climb Bank att: constant 45° Outside reference Aural-Normal envir. sound Control-Neutral stick pres. Motion-Constant positive G		St-1 (Y) 0 1 V M 2-C T-4 2 L-1 1P SJ 3 EA MAINTAIN CLIMB TURN CONTROL/AI-RU-EL R-1
2.		Sustains 45° bank & 500'/min. climb	
3.			Maintains climb & turn control
(Z) 1.	BEGINS ROLL OUT TO STRAIGHT & LEVEL FLIGHT Visual-Pitch att: climb Bank att:constant 45° Outside reference: section line Instr. cross-check Aural-Normal envir. sound Control-Neutral stick pres Motion-Constant positive G		St-1 (Z) 15 1 V M 2-C T-5 2 L-4 RF SJ 3 ER AI RU/EL, TH R-5

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. St-1 **TASK** Standarl task

TASK GOAL To develop prescribed skills **DATE** July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(Z) 2.	BEGINS ROLL OUT TO STRAIGHT	& LEVEL FLIGHT Anticipates rolling out of climbing turn to straight & level flight, normal cruise	
3.			Coordinates aileron & rudder, increases elevator pressure, & adjusts throttle
(A') 1.	CONTINUES ROLL OUT Visual-Pitch att:decreasing Bank att: rolling Outside reference Instr. cross-check Aural-Chge. in envir. sound Control-Increased stick & rudder pressure Motion-Decreasing positive G, pitching down, rolling		St-1(A') 45 1 VA CM 4C T10 2 L-4 MC CJ 3 ER AI RU/EL.TH R5
2.		Determines satisf. roll rate & need to reduce power	
3.			Maintains coord. aileron & rudder pressure, reduces elevator pressure & adjusts throttle
(B') 1.	CONTINUES ROLL Visual-Pitch att:decreasing Bank att: rolling Outside reference Instr. cross-check Aural-Chge. in envir. sound Control-Constant aileron & rudder pressure, increased elevator pressure & throttle reduction Motion-Decreasing positive G, pitching down,rolling		St-1(B') 22 1 VA CM 4C T-11 2 L-2 MC SJ 3 EA AI RU/FL R2

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. St-1 TASK Standard task

TASK GOAL To develop prescribed skills DATE July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(B')	CONTINUES ROLL		
2.		Determines approaching wings level	
3.			Moves aileron, relaxes rudder & maintains elevator pressure
(C')	STOPS ROLL		S-1 (C') 27* 1 V M 2-C T-6 2 L-2 MC SJ. 3 EA TR/EL R-2
1.	Visual-Pitch att: cruise Bank att: level Instr. cross-check Aural-Normal envir. sound Control-Elevator pressure Motion-Normal G, pitch & roll stabilized		
2.		Determines trim required	
3.			Adjusts trim & relaxes elevator pressure
(D')	ESTABLISHES STEADY-STATE, STRAIGHT & LEVEL AT 18,000'		S-1 (D') 0 1 V 1-C T-4 2 L-1 MC SJ 3 EA MAINTAINS CRUISE CONTROL/AI-RU-EL R-1
1.	Visual-Pitch att: cruise Bank att: level Outside reference Instr. cross-check Aural-Normal envir. sound Control-Neutral stick & rudder pressure Motion-Normal G		
2.		Determines str. & level @ 18,000' achvd. & need to transition to low cruise	
3.			Maintains cruise control

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. St-1 **TASK** Standard task

TASK GOAL To develop prescribed skills **DATE** July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(E')	BEGINS TRANSITION TO LOW CRUISE		St-1 (E') 27*
1.	Visual-Pitch att: cruise Bank att: level Outside reference Instr. cross-check Aural-Normal envir. sound Control-Neutral pressure Motion-Normal G		1 V 1-C T-4 2 L-2 RP SJ 3 ER TH/EL R-2
2.		Anticipates transition to low cruise	
3.			Adjusts throttle & increases elevator pressure
(F')	STARTS DECELERATION		St-1 (F') 41*
1.	Visual-Pitch att:increasing Bank att: level Instr. cross-check Aural-Chgs. in envir. sound Control-Increased stick pres & throttle reduction Motion-Deceleration, normal G, pitching up		1 VA/CM 4-C T-8 2 L-1 MC CJ 3 ER EL R-1
2.		Determines satisf. power setting & pitch increase	
3.			Increases elevator pressure
(G')	CONTINUES DECELERATION		St-1 (G') 107*
1.	Visual-Pitch att:increasing Bank att: level Outside reference Instr. cross-check Aural-Normal envir. sound Control-Increased stick pressure Motion-Normal G,deceleration, pitching up		1 V/CM 3-C T-7 2 L-2 MC CJ 3 EA TH/EL R-2
2.		Determines proper airspeed approach.	

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. St-1 **TASK** Standard task

TASK GOAL To develop prescribed skills **DATE** July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(G') 3.	CONTINUES DECELERATION		Adjusts throttle & maintains elevator pressure
(H') 1.	STOPS DECELERATION Visual-Pitch att: nose high Bank att: level Instr. cross-check Aural-Chge. in envir. sound Control-Constant stick pres. & throttle advance Motion-Normal G, pitch stabilized		St-1 (H) 27* 1 V CM · 3-C · T-7 2 L-2 · MC · SJ 3 EA · TE/EL · R-2
2.		Determines speed correct & trim required	
3.			Adjusts trim & relaxes elevator
(I') 1.	ESTABLISHES STEADY STATE, LOW CRUISE, CONSTANT 18,000' Visual-Pitch att: nose high Bank att: level Aural-Normal envir. sound Control-Neutral stick pres. Motion-Normal G		St-1 (I) O 1 V · 1-C · T-2 2 L-1 · MC · SJ 3 EA · MAINTAINS CRUISE CONTROL [illegible] · R-1
2.		Determines constant altitude low cruise accomplished & need to transition back to normal cruise	
3.			Maintains cruise control
(J') 1.	BEGINS TRANSITION TO NORMAL CRUISE Visual-Pitch att: nose high Bank att: level Outside reference Instr. cross-check Aural-Normal envir. sound Control-Neutral pressure		St-1 (J) 57* 1 V · 1-C · T-4 2 L-2 · RP · SJ 3 ER · TH/EL · R-2

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. St-1 TASK Standard task

TASK GOAL To develop prescribed skills DATE July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(J') 1.	BEGINS TRANSITION TO NORMAL CRUISE Motion-Normal G		
2.		Anticipates transition to normal cruise	
3.			Adjusts throttle & decreases elevator pressure
(K') 1.	STARTS ACCELERATION Visual-Pitch att:decreasing Bank att: level Instr. cross-check Aural-Chge. in envir. sound Control-Increased stick pressure & throttle advance Motion-Normal G, acceleration, pitching down		St-1 (K) 141 * 1 VA CM 4-C T-8 2 L-1 MC CJ 3 ER EL R-1
2.		Determines satisf. power setting & pitch decrease	
3.			Decreases elevator pressure
(L') 1.	CONTINUES ACCELERATION Visual-Pitch att:decreasing Bank att: level Instr. cross-check Aural-Normal envir. sound Control-Increased stick pressure Motion-Normal G, acceleration, pitching down		St-1 (L) 107* 1 V CM 3-C T-6 2 L-2 MC CJ 3 EA TH/EL R-2
2.		Determines proper cruise speed approach. & constant 18,000' altitude	
3.			Adjusts throttle & maintains elev. pres.

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SITUATION Aircraft straight and level at cruise speed and power

TASK NO. St-1 **TASK** Standard task

TASK GOAL To develop prescribed skills **DATE** July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(M') 1.	STOPS ACCELERATION Visual-Pitch att: cruise Bank att: level Outside reference Instr. cross-check Aural-Chge. in envir. sound Control-Constant stick pres. & throttle reduction Motion-Normal G, pitch stabilized		St-1(M') 27* 1 VA CM 4-C T-8 2 L-2 MC SJ 3 EA TR EL R-2
2.		Determines airspeed correct & trim required	
3.			Adjusts trim & relaxes elevator pressure
(N') 1.	ESTABLISHES STEADY-STATE NORMAL CRUISE Visual-Pitch att: cruise Bank att: level Outside reference Instr. cross-check Aural-Normal envir. sound Control-Normal stick pres. Motion-Normal G		St-1(N') 0 1 V 1-C T-4 2 L-1 MC SJ 3 EA MAINTAINS CRUISE CONTROL AI-RU-EL R-1
2.		Determines steady-state cruise @ 18,000' established & need to commence a left 180° turn to arrive back to IP	
3.			Maintains cruise control
(O') 1.	BEGINS TURN Visual-Pitch att: cruise Bank att: level Outside reference Instr. cross-check Aural-Normal envir. sound		St-1(O') 162 1 V 1-C T-4 2 L-4 SC SJ 3 ER AI RU TH R-5

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. St-1 TASK Standard task

TASK GOAL To develop prescribed skills DATE July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(O') 1.	BEGINS TURN Control-Neutral pressure Motion-Normal G		
2.		Observes turning point	
3.			Coordinates aileron & rudder, increases elevator pressure
(P') 1.	STARTS ROLL Visual-Pitch att:increasing Bank att: rolling Outside reference Instr. cross-check Aural-Normal envir. sound Control-Increased stick & rudder pressure Motion-Positive G onset, rolling, pitching up		St-1(P') 150 1 V CM 3-C T-9 2 L-4 MC CJ 3 ER Al Ru EL,M R-5
2.		Determines satisf. roll rate & need for power	
3.			Maintains coord. aileron & rudder pressure, increases elevator pressure & adjusts throttle
(Q') 1.	CONTINUES ROLL Visual-Pitch att:increasing Bank att: rolling Instr. cross-check Aural-Chge. in envir. sound Control-Constant aileron & rudder pressure, increased elevator pressure, throttle advance Motion-Increasing positive G, rolling, pitching up		St-1(Q') 85 1 VA CM A-C T-11 2 L-4 MC CJ 3 EA Al Ru EL R-S

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. St-1 **TASK** Standard task

TASK GOAL To develop prescribed skills **DATE** July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(Q') 2.	CONTINUES ROLL	Determines proper bank attitude approaching	
3.			Coordinates aileron & rudder, maintains elevator pressure
(R') 1.	STOPS ROLL Visual-Pitch att: nose high Bank att: constant Instr. cross-check Aural-Normal envir. sound Control-Neutral aileron & rudder pressure, constant elevator pressure Motion-Constant positive G, pitch & roll stabilized		St-1 (R') 27* 1 V/CM 3-C T-7 2 L-2 MC SJ 3 EA TR/EL R-2
2.		Determines trim required	
3.			Adjusts trim & relaxes elevator pressure
(S') 1.	ESTABLISHES STEADY-STATE TURN Visual-Pitch att: nose high Bank att: constant Outside reference Instr. cross-check Aural-Normal envir. sound Control-Neutral stick & rudder pressure Motion-Constant positive G		St-1 (S') 0 1 V/M 2-C T-5 2 L-1 1P SJ 3 EA MAINTAINS TURN CONTROL/AI-RU-EL R-1
2.		Sustains 45° bank turn, level flight	
3.			Maintains turn control

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. St-1 TASK Standard task

TASK GOAL To develop prescribed skills DATE July, 1974

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(T')	BEGINS ROLL OUT TO STRAIGHT & LEVEL FLIGHT		St-1(T') 65 1 V M 2-C T-4 2 L-4 RP SJ 3 ER AI RU/EL R-5
1.	Visual-Pitch att: nose high Bank att: constant Outside reference Aural-Normal envir. sound Control-Neutral stick & rudder pressure Motion-Constant positive G		
2.		Anticipates rolling out of turn to str. & level flight, normal cruise @ IP	
3.			Coord. aileron & rudder, increases elevator pressure
(U')	STARTS ROLL OUT OF TURN		St-1(U') 160 1 V CM 3-C T-9 2 L-4 MC CJ 3 ER AI RU/EL R-5
1.	Visual-Pitch att:decreasing Bank att: rolling Outside reference Instr. cross-check Aural-Normal envir. sound Control-Increased stick & rudder pressure Motion-Decreasing positive G, pitching down, rolling		
2.		Determines satisf. roll rate & need to reduce power	
3.			Maintains coord aileron & rudder pres., reduces elev. pres. & adjusts throttle
(V')	CONTINUES ROLL OUT		St-1(V') 142 1 VA CM 4-C T-12 2 L-2 MC CJ 3 EA AI/RU/EL R-2
1.	Visual-Pitch att:decreasing Bank att: rolling Outside reference Instr. cross-check Aural-Chge. in envir. sound		

SITUATION Aircraft straight and level at cruise speed and power

TASK NO. St-1 TASK Standard task

TASK GOAL To develop prescribed skills DATE July, 1974

EL. SEQ	CUES	MENTAL ACTION	MOTOR ACTION
(V')	CONTINUES ROLL OUT		
1.	Control-Constant aileron & rudder pressure, incr. elevator pres. & throttle reduction Motion-Decreasing positive G, pitching down, rolling		
2.		Determines wings lvl. att. approaching	
3.			Moves aileron, relaxes rudder, & maintains elev. pres.
(W')	STOPS ROLL		
1.	Visual-Pitch att: cruise Bank att: level Outside reference Instr. cross-check Aural-Normal envir. sound Control-Neutral aileron & rudder pres, constant elevator pressure Motion-Normal G, pitch & roll stabilized		St-1(W') 27A V 1 CM 5-L F7 2 L2 MC SJ 3 EA TE EL E2
2.		Determines trim required	
3.			Adjusts trim & relaxes elev. pres.
(X')	ESTABLISHES STRAIGHT & LEVEL FLIGHT AT IP		
1.	Visual-Pitch att: level Bank att: level Outside reference Instr. cross-check Aural-Normal envir. sound Control-Neutral stick & rudder pressure Motion-Normal G		St-1(X) 0 1 V 1C T4 2 L-1 MC SJ 3 EA Maintains cruise control AI-EV-EL E1
2.		Determines goal is accomplished	
3.			Maintains cruise control

APPENDIX G

EXAMPLE FOUR DATA

SITUATION Aircraft at initial approach speed, level and maintaining ground track over centerline

TASK NO. Cp-2 TASK 360° overhead landing

TASK GOAL Land aircraft DATE Oct., 1973

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(A)	BEGINS PITCH OUT		Cp-2 (A) 162 1 V 1-C T-3 2 L-4 SC SJ 3 ER A'RU3/EL TH R-5
1.	Visual-Pitch att: cruise Bank att: level Outside ref, approaching pitch out point Aural-Normal envir. sound Control-Neutral pressure Motion-Normal G		
2.		Observes pitch out point	
3.			Coordinates aileron & rudder, moves elev., throttle adjustment
(B)	STARTS PITCH OUT		Cp-2 (B) 145 1 VA CM A-0 T-11 2 L-4 MC CJ 3 ER {A'RU/EL R-6
1.	Visual-Pitch att: increasing Bank att: rolling Instr. cross-check Aural-Change in envir. sound Control-Increased stick & rudder pressure; throttle reduction Motion-Positive G onset, deceleration, rolling pitching up		
2.		Determines satisf. roll rate & pitch attitude	
3.			Maintains coordinated aileron & rudder pres. & increases elevator pressure
(C)	CONTINUES PITCH OUT		
1.	Visual-Pitch att: increasing Bank att: rolling Outside reference Instr. cross-check Aural-Change in envir. sound		

SITUATION Aircraft at initial approach speed, level and maintaining ground track over centerline

TASK NO. Cp-2 TASK 360° overhead landing

TASK GOAL Land aircraft DATE Oct., 1973

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(C) 1.	CONTINUES PITCH OUT Control-Constant aileron & rudder pressure, increased elevator pressure Motion-Increasing positive G, deceleration, rolling, pitching up		Cp-2(C) 145 1 VA CM 4-C T-12 2 L-4 MC CJ 3 ER AI RU EL R-5
2.		Determines proper bank angle approaching	
3.			Coordinates aileron & rudder, and moves elevator
(D) 1.	STOPS ROLL IN Visual-Pitch att: increasing Bank att: constant Instr. cross-check Aural-Change in envir. sound Control-Neutral aileron & rudder pressure, increased elevator pressure Motion-Constant positive G, decelerating, rolling stabilized, pitching up		Cp-2 (D) 166 1 VA CM 4C T-9 2 L-2 1P SJ 3 ER EL R-1
2.		Sustains bank att.	
3.			Increases elevator pressure
(E) 1.	HOLDS ESTABLISHED BANK Visual-Pitch att: increasing Bank att: constant Outside reference Aural-Change in envir. sound Control-Increased stick pres Motion-Constant positive G, deceleration, pitching up		Cp-2(E) 145 1 VA CM 4-C T-P 2 L-4 MC CJ 3 ER AI RU EL R-5

SITUATION Aircraft at initial approach speed, level and maintaining ground track over centerline

TASK NO. Cp-2 TASK 360° overhead landing

TASK GOAL Land aircraft DATE Oct., 1973

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(E) 2.		Determines roll out point	
3.			Coordinates aileron, rudder & moves elevator
(F) 1.	STARTS ROLL OUT Visual-Pitch att: increasing Bank att: rolling Instr. cross-check Aural-Change in envir. sound Control-Increased stick & rudder pressure Motion-Decreasing positive G, decelerating, rolling, pitching up		Cp-2 (F) 145 1 VA CM 4-C T-10 2 L-4 MC CJ 3 ER {Al Ru EL R-5
2.		Determines pitch attitude & roll rate satisfactory	
3.			Coordinates aileron & rudder, and moves elevator
(G) 1.	CONTINUES ROLL OUT Visual-Pitch att: increasing Bank att: rolling Outside reference Aural-Changing envir. sound Control-Constant aileron & rudder pres. & increasing elevator pres Motion-Decreasing positive G, Decelerating, rolling, pitching up		Cp-2 (G) 65 1 VA CM 4C T-11 2 L-4 MC SJ 3 ER {Al Ru EL R-5
2.		Determines approaching wings level	
3.			Coordinates aileron & rudder, and moves elevator

SITUATION Aircraft at initial approach speed, level and maintaining ground track over centerline

TASK NO. Cp-2 TASK 360° overhead landing

TASK GOAL Land aircraft DATE Oct., 1973

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(H)	STARTS DOWN-WIND		
1.	Visual-Pitch att: increasing Bank att: level Outside reference Instr. cross-check Aural-Normal envir. sound Control-Neutral aileron & rudder pres, increasing elevator pres. Motion-Normal G, decelerating, rolling stabilized, pitching up		Cp-2 (H) 67 1 V CM 3-C T-8 2 L-2 MC SJ 3 ER OO EL R-2
2.		Determines need for speed brake	
3.			Activates speed brake & moves elevator
(I)	CONTINUES DOWN-WIND		
1.	Visual-Pitch att: changing Bank att: level Outside reference Instr. cross-check Aural-Change in envir. sound Control-Speed brake switch movement & increased stick pressure Motion-Normal G, deceleration, buffeting, & pitching		Cp-2 (I) 62 1 VA CM 4-C T-10 2 L-2 MC SJ 3 ER OO EL R-2
2.		Determines speed to lower gear	
3.			Activates gear & moves elevator
(J)	CONTINUES DOWN-WIND		
1.	Visual-Pitch att: changing Bank att: level Outside reference Instr. cross-check Aural-Change in envir. sound		

SITUATION Aircraft at initial approach speed, level and maintaining ground track over centerline

TASK NO. Cp-2 TASK 360° overhead landing

TASK GOAL Land aircraft DATE Oct., 1973

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(J) 1.	CONTINUES DOWN-WIND Control-Gear handle movement & increased stick pressure Motion-Normal G, deceleration, buffeting & pitching		Cp-2(J) 142 1 VC AM | A-C | T-10 2 L-2 | MC | CJ 3 ER | EL TH | R-2
2.		Determines gear down & need for increased power	
3.			Moves elevator & adjusts throttle
(K) 1.	STARTS ROLL INTO FINAL TURN Visual-Pitch att: nose high Bank att: level Outside reference Instr. cross-check Aural-Change in envir. sound Control-Throttle increase & increasing stick pressure Motion-Normal G, vibration, pitching		Cp-2(K) 145. 1 VA CM | A-C | T-9 2 L-4 | MC | CJ 3 ER | AI RU EL | 00 | R-5
2.		Determi [illegible] position for beginning final turn & flap extension	
3.			Coordinates aileron & rudder, moves elev; activates flaps
(L) 1.	CONTINUES ROLL Visual-Pitch att:decreasing Bank att: rolling Outside reference Instr. cross-check Aural-Change in envir. sound		

SITUATION Aircraft at initial approach speed, level and maintaining ground track over centerline

TASK NO. Cp-2 **TASK** 360° overhead landing

TASK GOAL Land aircraft **DATE** Oct., 1973

<table>
<tr><th>EL. SEQ.</th><th>CUES</th><th>MENTAL ACTION</th><th>MOTOR ACTION</th></tr>
<tr><td>(L)
1.</td><td>CONTINUES ROLL
Control-Flap handle movement, increased stick & rudder pressure
Motion-Normal G onset, deceleration, rolling, pitching down</td><td></td><td>Cp-2 (L) 145<table><tr><td>1</td><td>VA
CM</td><td>4-C</td><td>T-12</td></tr><tr><td>2</td><td>L-4</td><td>MC</td><td>CJ</td></tr><tr><td>3</td><td>ER</td><td>AI
RU
EL</td><td>R-5</td></tr></table></td></tr>
<tr><td>2.</td><td></td><td>Determines flaps extended, pitch attitude & roll rate satisfactory</td><td></td></tr>
<tr><td>3.</td><td></td><td></td><td>Maintains coordination of aileron & rudder & maintains elevator pressure</td></tr>
<tr><td>(M)
1.</td><td>STOPS ROLL
Visual-Pitch att: correct
Bank att: rolling
Outside reference, correct ground track
Instr. cross-check
Aural-Normal envir. sound
Control-Constant stick & rudder pressure
Motion-Normal G, rolling, pitch stabilized</td><td></td><td>Cp-2 (M) 110.<table><tr><td>1</td><td>V
CM</td><td>3-C</td><td>T-8</td></tr><tr><td>2</td><td>L-4</td><td>MC</td><td>CJ</td></tr><tr><td>3</td><td>EA</td><td>AI
RU
EL</td><td>R-5</td></tr></table></td></tr>
<tr><td>2.</td><td></td><td>Determines correct pitch & bank attitude approaching</td><td></td></tr>
<tr><td>3.</td><td></td><td></td><td>Coordinates aileron & rudder, and moves elevator</td></tr>
<tr><td>(N)
1.</td><td>CONTINUES FINAL TURN
Visual-Pitch att: descent
Bank att: constant
Outside reference
Instr. cross-check
Aural-Normal envir. sound</td><td></td><td></td></tr>
</table>

SITUATION Aircraft at initial approach speed, level and maintaining ground track over centerline

TASK NO. Cp-2 **TASK** 360° overhead landing

TASK GOAL Land aircraft **DATE** Oct., 1973

<table>
<tr><th>EL. SEQ.</th><th>CUES</th><th>MENTAL ACTION</th><th>MOTOR ACTION</th></tr>
<tr><td>(N)
1.</td><td>CONTINUES FINAL TURN
Control-Neutral aileron & rudder; constant elevator pressure
Motion-Normal G, rolling stabilized</td><td></td><td>Cp-2 (N) 150<table><tr><td>1</td><td>V
CM</td><td>3-C</td><td>T-6</td></tr><tr><td>2</td><td>L-4</td><td>RP</td><td>CJ</td></tr><tr><td>3</td><td>ER</td><td>AI
RU
EL | TH</td><td>R-5</td></tr></table></td></tr>
<tr><td>2.</td><td></td><td>Anticipates roll out on final & need for throttle increase</td><td></td></tr>
<tr><td>3.</td><td></td><td></td><td>Coordinates aileron, rudder & elevator; adjusts throttle</td></tr>
<tr><td>(O)
1.</td><td>STARTS ROLL OUT ON FINAL
Visual-Pitch att: descent
Bank att: rolling
Outside reference
Instr. cross-check
Aural-Change in envir. sound
Control-Increased stick & rudder pressure; advances throttle
Motion-Normal G, rolling</td><td></td><td>Cp-2 (O) 145<table><tr><td>1</td><td>V A
CM</td><td>4-C</td><td>T-9</td></tr><tr><td>2</td><td>L-4</td><td>MC</td><td>CJ</td></tr><tr><td>3</td><td>ER</td><td>AI
RU
EL</td><td>R-5</td></tr></table></td></tr>
<tr><td>2.</td><td></td><td>Determines pitch attitude & roll rate satisfactory</td><td></td></tr>
<tr><td>3.</td><td></td><td></td><td>Coordinates aileron & rudder; moves elevator</td></tr>
<tr><td>(P)
1.</td><td>CONTINUES ROLL OUT
Visual-Pitch att: descent
Bank att: rolling
Outside reference
Instr. cross-check
Aural-Normal envir. sound
Control-Constant stick & rudder pressure
Motion-Normal G, rolling</td><td></td><td>Cp2 (P) 30<table><tr><td>1</td><td>V
CM</td><td>3-C</td><td>T-7</td></tr><tr><td>2</td><td>L-4</td><td>MC</td><td>SJ</td></tr><tr><td>3</td><td>EA</td><td>AI
RU
EL</td><td>R-5</td></tr></table></td></tr>
</table>

SITUATION Aircraft at initial approach speed, level and maintaining ground track over centerline

TASK NO. Cp-2 TASK 360° overhead landing

TASK GOAL Land aircraft DATE Oct., 1973

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(P)	CONTINUES ROLL OUT		
2.		Determines wings level	
3.			Coordinates aileron & rudder, and moves elevator
(Q)	STOPS ROLL		Cp-2 (Q) 176 1 V CM 3-C T-6 2 L-2 IP CJ 3 EA TH EL R-2
1.	Visual-Pitch att: descent Bank att: level Outside reference Instr. cross-check Aural-Normal envir. sound Control-Neutral aileron & rudder; constant elevator pressure Motion-Normal G, rolling stabilized		
2.		Sustains approach attitude & determines trim required	
3.			Adjusts trim & relaxes elevator pres.
(R)	ESTABLISH STEADY-STATE		Cp-2 (R) 157 1 V 1-C T-A 2 L-2 MC CJ 3 ER TH EL R-2
1.	Visual-Pitch att: descent Bank att: level Outside reference Instr. cross-check Aural-Normal envir. sound Control-Neutral stick & rudder Motion-Normal G		
2.		Determines position for round out & position to decrease rate of descent	
3.			Adjusts throttle & moves elevator

SITUATION Aircraft at initial approach speed, level and maintaining ground track over centerline

TASK NO. Cp-2 TASK 360° overhead landing

TASK GOAL Land aircraft DATE Oct., 1973

<table>
<tr><th>EL. SEQ.</th><th>CUES</th><th>MENTAL ACTION</th><th>MOTOR ACTION</th></tr>
<tr><td>(S)
1.</td><td>STARTS ROUND OUT
Visual-Pitch att: increasing
Bank att: level
Outside reference
Instr. cross-check
Aural-Change in envir. sound
Control-Increased stick pressure & throttle reduction
Motion-Normal G, pitching up, deceleration</td><td></td><td>Cp-2(S) 142<table><tr><td>1</td><td>VA
CM</td><td>A-C</td><td>T-9</td></tr><tr><td>2</td><td>L-2</td><td>MC</td><td>CJ</td></tr><tr><td>3</td><td>ER</td><td>EL
TH</td><td>R-2</td></tr></table></td></tr>
<tr><td>2.</td><td></td><td>Determines speed & rate of descent satisfactory</td><td></td></tr>
<tr><td>3.</td><td></td><td></td><td>Moves elevator & adjusts throttle</td></tr>
<tr><td>(T)
1.</td><td>COMPLETES ROUND OUT
Visual-Pitch att:increasing
Bank att: level
Outside reference
Aural-Change in envir. sound
Control-Increased stick pres. & throttle reduction
Motion-Normal G, decelerating</td><td></td><td>Cp-2(T) 82<table><tr><td>1</td><td>VC
AM</td><td>A-C</td><td>T-7</td></tr><tr><td>2</td><td>L-2</td><td>RP</td><td>CJ</td></tr><tr><td>3</td><td>EA</td><td>EL
TH</td><td>R-2</td></tr></table></td></tr>
<tr><td>2.</td><td></td><td>Anticipates touchdown</td><td></td></tr>
<tr><td>3.</td><td></td><td></td><td>Moves elevator & adjusts throttle</td></tr>
<tr><td>(U)
1.</td><td>TOUCHDOWN
Visual-Pitch att: nose high
Bank att: level
Outside reference
Aural-Change in envir. sound
Control-Increased stick pressure and throttle reduction
Motion-Normal G, vibration & deceleration</td><td></td><td>Cp-2(U) 102<table><tr><td>1</td><td>VA
CM</td><td>A-C</td><td>T-9</td></tr><tr><td>2</td><td>L-2</td><td>MC</td><td>CJ</td></tr><tr><td>3</td><td>EA</td><td>EL
00
00
00</td><td>R-2</td></tr></table></td></tr>
</table>

SITUATION Aircraft at initial approach speed, level and maintaining ground track over centerline

TASK NO. Cp-2 TASK 360° overhead landing

TASK GOAL Land aircraft DATE Oct., 1973

EL. SEQ.	CUES	MENTAL ACTION	MOTOR ACTION
(U)	TOUCHDOWN		
2.		Determines proper speed to lower nosewheel & retract speedbrake; engages nosewheel steering & retracts flaps	
3.			Relaxes elevator; activates speedbrake, nosewheel steering & flaps
(V) 1.	STARTS ROLL OUT Visual-Runway centerline Instr. cross-check Aural-Change in envir. sound Control-Decreased stick pressure; flaps, nosewheel steering & speedbrake movement Motion-Normal G, vibration & deceleration		Cp-2 (V) 22 1 VC AM 4-C T-9 2 L-2 MC SJ 3 EA OO RU R-2
2.		Determines need for brakes & directional control	
3.			Activates brakes & maintains directional control with rud.
(W) 1.	COMPLETES ROLL OUT Visual-Runway centerline Aural-Change in envir. sound Control-Increased brake pressure Motion-Deceleration, normal G, vibration		Cp-2 (W) 0 1 VA CM 4-C T-5 2 L-2 MC SJ 3 EA — —
2.		Determines aircraft decelerating & goal accomplished	
3.			Maintains roll out control

GLOSSARY

Activates - the discrete engagement of a specific control such as a toggle switch in the surface analysis.

Adjusts - the incremental regulation of a specific control described in the surface analysis.

Anticipate - describes the mental state which is the precursor of subsequent motor action.

Attitude - the position of the aircraft considering the inclination of its axis in relation to the horizon.

Aural - cues or stimuli which can be sensed through hearing.

Bank - to tip, or roll about the longitudinal axis of the aircraft. (Banks are incidental to all properly executed turns.)

Basic Skill - a fundamentally learned series or forged element chain which can be triggered by a single set of cues or stimuli.

Basic Skill Group - the grouping of basic skills categorized within a specific sorting slot which exhibit the same properties.

Classification Hierarchy - the ranking or grading of the nine adopted classification rules in successive order based on both value judgments and empirical evaluation.

Classification Rules - the set of nine guidelines adopted in this study which were used to establish the behavioral element categories for the Cues, Mental Action and Motor Action components of the surface task analysis.

Classification Rules Instructions - the concise set of regulations which determined the application of each classification rule to information described in each task sequence with the surface analysis.

Climb - a state of flight in which the aircraft is increasing in altitude.

Composite Transitional Task - two or more fundamental transitional tasks combined to perform a more complex flying requirement. Composite transitional tasks have a Cp designator in the surface analysis.

Continuous Iterative Processing - the mental action thought of in terms of cyclic activity which occurs during the steady-state portion of a flying task.

Continuous Transitional Task - any number of fundamental transitional and specialized tasks combined in a rapid sequence to complete an aerobatic flying requirement. Continuous transitional tasks have a Ct designator in the surface analysis.

Control - a device used by a pilot in operating an airplane.

Control Feedback - cues or stimuli which can be sensed by body limbs or extremities through the control devices of the aircraft. The control feedback input has been shortened to Control in the cues column of the surface analysis.

Coordinate - the movement or use of two or more controls in their proper relationship to obtain a desired effect.

Coordinated Outputs - those control actions which were performed simultaneously in the Motor Action description of the surface task analysis.

Cue - environmental or system stimuli which excite the sensory systems of the human body.

Descend - a state of flight in which the aircraft is decreasing in altitude.

Determine - to reach a decision.

Effector Output - pilot Motor Action in terms of control exerted on the aircraft, (i.e. elevator movement resulting from control stick movement to change aircraft pitch attitude).

Flare Out - to decrease the rate of descent and airspeed by slowly raising the nose of the aircraft during landing.

Fundamental Transitional Task - one of the fourteen control segments derived from combinations of the four steady-state flight paths.

Glide - sustained forward flight at idle power in which airspeed is maintained only by loss of altitude.

Horizontal Sorting - the operation of examining task skills in the classification matrix at a given level without regard to the categories at other levels.

Intermediate Skill - a combination of two or more basic skills chained together to form a skill cluster.

Long Term Memory - information which was acquired prior to the performance of the skill.

Maintains - the continuation of a controlling pressure on an aircraft control described in the surface analysis.

Maneuver - any planned motion of the aircraft in the air or on the ground.

Maneuver Analysis Kit - the assembly of classification instructions, surface task analyses, and behavioral element categories into an organized folder to be used in the classification of task sequence information by validation subjects and project researchers.

Matrix Sub-Block - that portion of the classification matrix made up of twenty sorting slots which specifically categorized all skills with respect to Cue kind, complexity; and Motor Action complexity rules and provides the framework for the further isolation of skills into basic skill groups.

Memory Recall Processing - the mental action involving the recollection of procedures or facts about the performance of a task prior to performing it.

Mental Action - cognitive process initiated by perceived stimulus cues and preceding motor actions.

Motion - cues or stimuli which can be sensed by the body receptors as a result of aircraft movement.

Motor Action - those physical actions resulting in movement of aircraft controls.

Moves - the displacement of a control from a previous position as described in the surface analysis.

Multi-Cue Processing - the mental action concerned with problem solving and decision making, involving multiple cues and evaluation of potential action.

Non-Coordinated Outputs - those control actions which were performed sequentially in the Motor Action description of the surface task analysis. (Non-coordinated outputs should not be confused with "un-coordinated control" which generally carries the connotation of simultaneous outputs executed with improper technique.)

Observes - the selection of a dominant environmental or aircraft generated cue upon which a motor action is based.

Operational Task - a combination of composite or continuous transitional tasks which form a part of the flying repertoire that is essential to the performance of operational duties. Takeoffs and landings are examples of the most basic operational tasks.

Pitch - the angular displacement of the longitudinal axis of the aircraft with respect to the horizon.

Primary Classification Matrix Board - the board upon which the taxonomic hierarchical system of basic divisions, subblocks and sorting slot divisions was developed for the orderly categorization of classified skill information.

Procedural Skill - a cluster of intermediary skills strung together to form a repertoire of piloting capability.

Raw Data - surface analysis data which has been classified and coded into response card information.

Relaxes - the reduction of a controlling pressure on an aircraft control described in the surface analysis.

Response Card - the notation form designed to hold the coded basic skill information of an individual task sequence as determined by the behavioral element categories within the classification rules. The response card is also called a skill card in the text because of the coded basic skill information it contains.

Roll - displacement around the longitudinal axis of the aircraft.

Short Term Memory - information remembered which was obtained during the performance of a skill.

Skill - all behavior elements used in the performance of a task sequence.

Sorting Slot - the grouping area within the matrix subblock which categorized skills with respect to motor action control and complexity, and mental action complexity, and isolated all skills into basic skill groups.

Specific Cue Processing - the mental action dealing with the perception and recognition of a specific cue and related to the use of short term memory storage.

Steady-State - flight situation when the dynamic forces are trimmed to allow essentially "hands off" flight.

Straight-and-Level - a state of flight in which the aircraft is in a constant heading at a constant altitude with wings in the same plane as the horizon.

Surface Analysis - a systematic description of an interaction between surface elements; i.e. cue and motor action and the depth element, mental action; as they relate to the environment, the criteria, and the system.

Sustains - the thought process which integrates the actions for the steady-state portions of a task or maneuver described in the surface analysis.

Task - a group of related work elements performed in close temporal proximity by one person and directed toward the accomplishment of a definable goal.

Task Element - the smallest part of the surface analysis which is expressed as a major input or action heading, i.e. cues or mental actions or motor actions are task elements of the analysis.

Task Sequence - a complete set of interacting behavioral elements (i.e., cues, mental action, and motor action) found in the surface analysis.

Taxonomy - a manner of classifying, and the rules and principles concerned with classification of phenomena in such a way that a more useful relationship can be established among them.

Training Task - a structured combination of tasks which have been developed to build specific flying skills that convey the essence of a particular operational task.

Transition - the activities required to change from one steady-state to another.

Trim - the balance of all dynamic forces of the aircraft so the aircraft can be flown essentially "hands off" the controls.

Turn - to create a change of direction of flight by causing the aircraft to roll about its longitudinal axis.

Vertical Sorting - the operation of examining task skills in the matrix by applying the classification hierarchy in a sequentially oriented procedure.

Visual - cues or stimuli which can be sensed by the eye.

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